

Spring 2025

Section 1: English Grammar and Vocabulary

1. __ Mostafa__ Rashid was accused in the murder case.
A. Either, nor **B. Not only, but also** C. And, also D. Neither, or
2. She, along with her son, ____ present at the function that ____ place last night.
A. Is, takes B. Was, take **C. Was, took** D. Were; took
3. The road became so ____ after the incident.
A. Calmness **B. Quiet** C. Commotion D. Chaos
4. Neither the T-shirt nor the pant ____ blue in color.
A. Were B. Are **C. Is** D. Was
5. My salary has been increased, but the workload has___.
A. Escalate **B. Decreased** C. Also increased D. Also got bigger
6. Not only is she friendly, ____ in helping find friends.
A. But also mean **B. But also cooperative** C. But also poor D. But also cunning
7. I ____ understand why he didn't call us back.
A. Cant **B. Can't** C. Cant' D. None
8. She ____ study harder next year, but by then she ____ already completed the easier courses.
A. Will, will have B. Will, will C. Will have, will D-Will,will have been
9. There ____ many factors affecting teacher retention.
A. Is B. Was **C. Are** D. Has
10. Walk__ the garage and then turn left.
A. Toward B. Along C. Within D. Off
11. The police ____ the criminal last night.
A. Arrest **B. Arrested** C. Have Arrest D. Should Arrest
12. ____ beggars are not always needy.
A. An **B. The** C. A D. None

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13. When the teacher entered the classroom, the students ___ up to greet her.
A. Stands **B. Stood** C. Standing D. Had stood
14. A pride of lions ___ fighting ___ itself.
A. Are, between B. Is, between **C. Is, among** D. Are, among
15. Which one is correct?
A. mr.Ratul kalam B. Mr. ratul kamal C. mr. ratul kalam **D. Mr. Ratul Kamal**
16. I have been looking all over for you everywhere. ___ ?
A. Where you been **B. Where were you** C. you where D. Where was you
17. The bird flew to ___ nest at Lija's home.
A. It is B. Its's **C. Its** D. It's
18. Everybody ___ to succeed __ life.
A. Want, in **B, Wants, in** C. Wants, on D, Fail, in,
19. He ___ peak of the hill to enjoy the view.
A. Climbed up B. Stepped up C. Climb on D. Climb down
20. He is the ___ boy in the class, ___ ?
A. Most diligent, isn't he B. More diligent, isn't he
C. Most diligent, is he D. Diligent, isn't he
21. Which of the following spelling is correct?
A. Accomodation **B. Accommodation** C. Acommolation D. Accomodasian
22. They are going to the concert, ___ ?
A. Are they B. Is there C. Will they **D. Aren't they**
23. The pyramid of Giza is one of the ___ of the world.
A. Iconic structures B. Wonderful building
C. Remarkable landmark D. Awe-inspiring site
24. Everybody prepared their best, but Rayka prepared ___.
A. Her best **B. The least** C. Better D. The most
25. Guess ___ coming for dinner?
A. Whose **B. Who's** C. Whos D. Whoms
26. NSU holds seminars to ___ knowledge.

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A. Dissipate **B. Enrich** C. Enlarge D. Enhance

27. Traveling is the best way to ____ new experience.

A. Gathering **B. Gather** C. Collecting D. Dissuade

28. The Rahmans ____ their children well.

A. Have raised B. Has raised C. Have risen D. Have been rising

29. The ball kicked the boy. According to the meaning, the sentence seems -

A. Incorrect B. Odd C. Correct D. Incorrectly

30. The hill climbing view is often described as ____ for its awe-inspiring beauty.

A. Stunned **B. Breathtaking** C. Tedious D. Mundane

31. He tried to jump ____ the fence, and he will meet you ____ the main gate in an hour.

A. Over, at B. On, in C. Above, near D. Across, beside

32. ____ of the students ____ submitted their assignments.

A. Each, have **B. Each, has** C. All, has D. None, has

33. If you feel any more pain, then you ____ go to the doctor.

A. Must have to **B. Will have to** C. Having to D. Have to

34. ____ you are after all I did for you!

A. How ungrateful B. How grateful **C. How ungrateful** D. How greatness

35. Either ____ is going, or ____ am going.

A. He, I B. He, Me C. Him, I D. Him, Me

36. I love to paint, read, and also ____ video games in my free time.

A. Play B. Playing C. Played D. Will play

37. All of the ____ rooms were painted.

A. Teachers B. Teacher's **C. Teachers'** D. Teacher

38. They are going to celebrate ____ friend's birthday party at the house over ____.

A. Their, their **B. Their, there** C. They're, there D. There, there

39. He always ____ to help others, but yesterday he ____ to assist his friend.

A. Tries / forgot B. Trying / forgets

C. Tried / had forgotten D. Tries / had forgotten

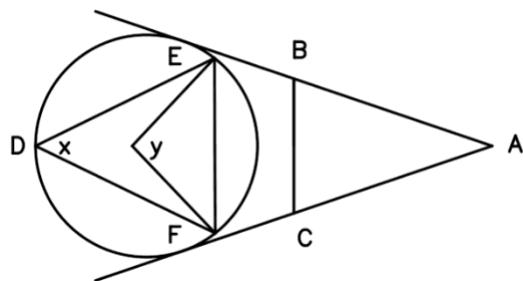
40. The old ____ weak in general, and they cannot help ____ to diseases.

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- A. Is, succumb B, Is, succumbing C. Are, succumb D. Are, succumbing

Section 2: Quantitative Aptitude

1.



ΔDEF is an isosceles triangle & $\angle DEF = 65^\circ$, Find the value of $\angle y$.

- A. 25° B. 125° C. **100°** D. 65° E. 50°

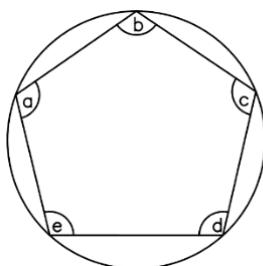
2. Diameter of a circle is 8 cm, and radius of another circle is 4 cm. If both the circles externally touch, then what is the distance between the centers of these circles?

- A. 4 B. **8** C. 12 D. 6 E. None

3. $2 - 4 + 8 - 16 + 32 - 64 \dots$ what is the sum of the first 7 terms of the series?

- A. 80 B. **86** C. 90 D. 128 E. 286

4.

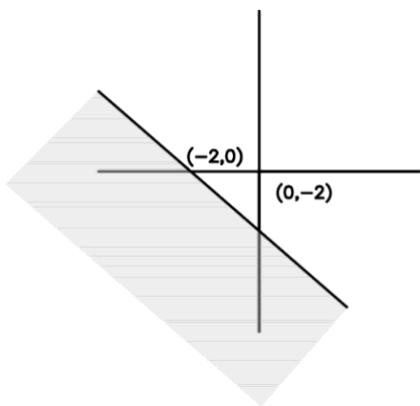


What is the sum of the total angles?

- A. 180° B. 270° C. 360° D. **540°** E. none

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5.



What will be the equation of the inequality from the graph?

- A. $x = y$ B. $x + y < -2$ C. $x - y > 2$ D. $x + 2 = y$ E. $x + y \leq -2$

6. If $f(x) = \frac{2x+1}{2x-1}$, then what is the value of $\frac{f(\frac{1}{x^2})+1}{f(\frac{1}{x^2})-1}$?

- A. $\frac{1}{x}$ B. $\frac{2}{x}$ C. x^2 D. $\frac{2}{x^2}$ E. none

$$7. \frac{(5)^{-1} \cdot a \cdot 5}{5a \cdot 5^{-1}} = ?$$

- A. 1 B. 2 C. 3 D. 4 E. 5

8. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$ and $B = \{6, 9\}$ then find the value of $\{U - (A \cup B)\}$?

- A. {1, 2, 3} B. {2, 9, 0} C. {5, 7, 8} D. {4, 10, 11} E. none

9. If $(a - 3)(a - 4)(a - 6) = 12$ then what is the value of a ?

- A. 0 B. 3 C. 6 D. 7 E. None

10.

31-40	41-50	51-60	61-70
8	6	9	12

What will be the mode of the table?

- A. (31-40) B. (41-50) C. (51-60) D. (61-70) E. none

11. Total age of a father and son is 70 years. 7 years ago the age ratio was 2:5. After 5 years the ratio will be-

- A. 1:2 B. 4:5 C. 15:8 D. 13:7 E. none

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12. If $\frac{(x+1)+y}{2} = 5x$ then what will be the value of y?
- A. $x + 2$ B. $x + 9$ C. $9x - 1$ D. $9x + 1$ E. none
13. If ratio of angles of a triangle is 3:4:5 then what will be the smallest angle?
- A. 30° B. 45° C. 60° D. 90° E. none
14. If $a, b, c \neq 0$, $a^x = b$, $b^y = c$, $c^z = a$ then what is the value of $2xyz$?
- A. 1 B. 2 C. 3 D. 4 E. 5
15. A person buys 30 books for 100 takas. If he sells each book at 22 takas then how much profit he will get per book?
- A. 15 taka B. 16.01 taka C. 17.876 taka
D. 18.667 taka E. 20 taka
16. If $a = \tan x + \sin x$, $b = \tan x - \sin x$ then what will be the value of $a^2 - b^2$?
- A. $4\tan x \sin x$** B. $\tan x \cos x$ C. $2\tan x \sin x$ D. $\sin^2 x$ E. none
17. If $2x^2 + 3 = 0$ then find the value of x.
- A. $\frac{\sqrt{6}i}{2}$ B. i C. $-\frac{3}{2}$ D. 0 E. undefined
18. If $f(x) = x - 2$ and $y = 2x^2 - 8x + 8$, then the relation between y and $f(x)$ is:
- A. $y = 2f(x)$ B. $y^2 = f(x)^2$ C. $f(x) = \sqrt{y}$ D. $y = 2[f(x)]^2$ E. none
19. If $2 \begin{vmatrix} 3 & 2 \\ -9 & -7 \end{vmatrix} + \begin{vmatrix} 1 & -3 \\ -1 & 2 \end{vmatrix} - 2I = ?$
- A. $\begin{vmatrix} 5 & 1 \\ -19 & -14 \end{vmatrix}$ B. 1 C. $\begin{vmatrix} -5 & -1 \\ 19 & 14 \end{vmatrix}$
D. $\begin{vmatrix} 1 & -19 \\ -14 & 5 \end{vmatrix}$ E. None
20. There are 5 days of food for 50 ducks. If 25 more ducks are added, then how many days will the food continue?
- A. 3.33 days** B. 4.44 days C. 5.55 days D. 6.66 days E. none
21. What is the ratio of volume and surface area of a sphere?
- A. $r^3:3$ B. $\pi r^2:3$ C. $r^2:3$ D. $r:3$ E. none
22. A class has 60 students. If 4 students sit on each bench, then there are 3 empty benches remaining. If 3 students sit on each bench, only 54 students can be accommodated on the benches, leaving 6 students without seats. What is the number of benches in the class?

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- A. 15 B. 18 C. 19 D. 21 E. 10

23. What is the sum of the 1st 6 prime numbers?

- A. 42 B. 30 C. 32 D. 41 E. 64

24. The sum of five consecutive odd numbers is 235. Which of them is a prime number?

- A. 53 B. 37 C. 59 D. 47 E. None

45. If $\cos\theta = \frac{4}{5}$, what is the value of $\cot\theta$?

- A. $\frac{4}{7}$ B. $\frac{3}{5}$ C. $\frac{4}{3}$ D. $\frac{2}{5}$ E. $\frac{1}{5}$

26. How many proper subsets are there for $\{x, a, d\}$?

- A. 7 B. 8 C. 3 D. 11 E. 9

27. $\sin 0^\circ \cdot \sin 1^\circ \cdot \sin 2^\circ \dots \sin 90^\circ = ?$

- A. 1 B. 0 C. Infinity D. Undefined E. 1

28. $\log_5(125\sqrt{5}) = ?$

- A. 3 B. $\frac{3}{2}$ C. $\frac{5}{2}$ D. 4 E. $\frac{7}{2}$

29. A bicycle wheel completes 500 spins to cover a distance of 10 km. What is the radius of the wheel?

- A. 0.5 m B. $\frac{10}{\pi}$ m C. 0.5 km D. 2.17 m E. 4 m

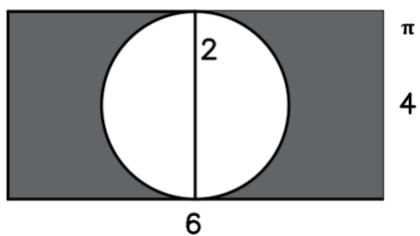
30. If $\frac{3}{4}$ of a number is 2 less than the 4 times the number, find out the number.

- A. 12 B. $\frac{45}{7}$ C. $\frac{8}{13}$ D. 0 E. $\frac{2}{15}$

31. Which one of the following fractions has the largest value?

- A. $\frac{1}{8}$ B. $\frac{5}{6}$ C. $\frac{5}{8}$ D. $\frac{2}{5}$ E. $\frac{1}{25}$

32.



π
4

What is the area of the shaded region?

- A. 11.44 B. 15 C. 12.2 D. 25 E. 24

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33. A square-shaped field has a path outside with a width of 5m. If the area of the path is 500 m^2 , what is the area of the field?

- A. 1025.55 **B. 400** C. 2025 D. 1200 E. 1000

34. $f(x)$ is a function where $f(x) = x^3 - 6x^2 - 13x + 1$. Find the value of $f(-1)$:

- A. 6 B. -7 **C. 7** D. 8 E. -6

35. If $x^2 + y^2 - 4x - 6y + c = 0$ is a circle equation, then what will be the center of it?

- A. (-2, -3) **B. (2, 3)** C. (-2, 3) D. (2, -3) E. None

36. If $a = \sqrt{7} + \sqrt{6}$, then find the value of $a + 1/a$:

- A. $2\sqrt{7}$** B. $2\sqrt{6}$ C. $\sqrt{7} - \sqrt{6}$ D. $\sqrt{7}$ E. None

37. If the ratio of the length and width of a rectangle is 3:7 and its perimeter is 150, what is the value of its area?

- A. 1000 B. 4025.55 **C. 1181.25** D. 2025 E. 1025

38. A 20-meter ladder is initially standing straight against a wall. How far should the bottom of the ladder be dragged away from the wall to maintain its position if the top of the ladder slides down the wall by 4 meters?

- A. 10m **B. 12m** C. 11m D. 9m E. 6m

39. In the series: 8, 11, 14, ..., 485, find the position of the term 485.

- A. 120 B. 144 C. 159 **D. 160** E. None

40. If $4^{x+2} = 128$, then what is the value of x?

- A. $\frac{3}{2}$** B. $\frac{5}{2}$ C. $\frac{4}{5}$ D. 6 E. 2

41. If two dice are thrown, what is the probability of getting a sum of 7?

- A. $\frac{7}{36}$ B. $\frac{1}{7}$ C. $\frac{5}{36}$ **D. $\frac{1}{6}$** E. $\frac{5}{6}$

42. What is the volume of a cylinder with radius $r = 5$ and height $h = 15$?

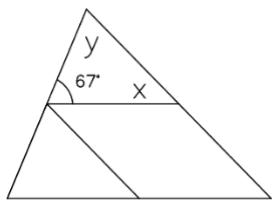
- A. 275π **B. 225π** C. 375π D. 350π E. None

43. Which of the following points satisfies the equation $2x + 3y - 5 = 0$, $4x - y - 3 = 0$?

- A. (1, 2) **B. (1, 1)** C. (2, 1) D. (2, -1) E. None

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44. What is the value of $\angle x + \angle y$?



- A. 180° B. **113°** C. 95° D. 67° E. 45°

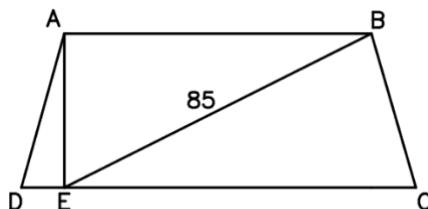
45. If $f(x) = |x + 2| + |x - 6|$, then what is the value of $f(-7)$?

- A. **18** B. 14 C. 20 D. 25 E. 12

46. When the ratio of 2 numbers is 3:4 and their LCM is 180, then what are the numbers?

- A. 45, 50 B. 40, 45 C. **45, 60** D. 60, 75 E. None

47.



If $DC = 57$ units and $AE = 36$, then find the area of the trapezium.

- A. 2412 B. 2500 C. 2450 D. 2000 E. 1850

48. Average of two numbers is $5x$. If one of them is $x + 1$, then what is the value of the other one?

- A. $6x-2$ B. $5x-5$ C. $3x-2$ D. $5x-3$ E. **9x-1**

49. What is the solution of the inequality: $2x - 3 > x + 5$?

- A. $x > 2$ B. **x > 8** C. $x < 6$ D. $x > 6$ E. $x < 8$

50. Which of the following function is true for $(x, -5)$?

- A. $x - 2y = 10$ B. **y = -5** C. $x + 2y = 10$ D. $x = -5$ E. None

Spring-25-SOLUTION

Section 1:

Explanations:

1. (B) "Not only.....but also" is the appropriate correlative conjunction.
2. (C) When two subjects are joined with the phrases 'along with,' 'together with,' 'accompanied with,' 'in addition to, etc., the verb agrees with the first subject; past form of the verb is used since 'last night' is mentioned,

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3. (B) "Quiet" is the appropriate noun because the aftermath of an incident often leads to silence or stillness.
4. (C) In sentences with "neither... nor," "either... or", the verb agrees with the subject closest to it.
- 5.(B) Because "but" contrasts the increased salary and the reduced workload.
6. (B) "But also cooperative" because "Not only... but also" pairs positive traits, and "co-operative" complements "friendly."
7. (B) The proper contraction of "cannot" is suitable for informal contexts.
8. (A) Because the first blank indicates a simple future action, and the second blank uses future perfect tense to show an action completed by a future point.
9. (C) In sentences beginning with "there is" or "there are," the subject-follows the verb: Since "there" is not the subject, the verb agrees with what follows the-verb.
10. (A) To refer to a spatial relationship, use the prepositions "above," "across," "against", "towards" etc.
11. (B) Here, a simple past is used since 'last night' is mentioned.
12. (B) 'The' is used to generalize the whole class or group.
13. (B) The sentence describes a completed action in the past, so the simple past tense "stood" is appropriate.
14. (C) "Pride" is a collective noun and that's why a singular verb will be taken; 'among' is used when referring to more than two entities.
15. (D) Proper nouns and titles should always start with capital letters.
16. (B) The correct form, "Where were you", follows proper subject-verb agreement ("you" with "were") and question word order (verb before the subject).
17. (C) "Its," without an apostrophe is the possessive form of "it".
18. (B) Everybody takes a singular noun after it; 'succeed in' is the appropriate preposition.
19. (A) "Climbed up" correctly indicates the action of ascending to the hill's peak.
20. (A) The + superlative degree; the sentence is positive, so the tag will be negative.
- 21.(B) "Accommodation" - a place where someone may live or stay.

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22. (D) The tag question will be negative since the main sentence is positive.
23. (A) The correct choice is "iconic structures" because "structures" is the plural form required after "one of the," and "iconic" describes these structures as globally significant.
24. (B) "Least" is used as a superlative adjective to compare Rayka's performance.
25. (B) "Who's" is the appropriate contraction of "who is".
26. (B) Enrich - is more suitable in the context of knowledge.
27. (B) After "to," the base form of the verb is appropriate.
28. (A) "Have raised" is appropriate since "The Rahmans" indicates a family, which is a plural subject.
29. (A) "incorrect" implies that the sentence is not properly arranged but "odd" could imply that the sentence is correct but sounds peculiar, which is not the case in this question.
30. (B) "Breathtaking" captures the stunning beauty of the view, unlike the other options.
31. (A) "Over" shows movement across the fence, and "at" specifies the exact meeting location.
32. (B) "Each" takes a singular verb after it.
33. (B) This is an example of the first conditional and follows the "If + present simple, then + will have to" structure.
34. (C) This sentence implies a negative undertone and that's why option c is correct.
35. (A) The pronouns "he" and "I" are correct because they are the appropriate subject pronouns for the sentence.
36. (A) To maintain a parallel structure, "play' is appropriate.
37. (C) "Teachers" is correct because it indicates possession, showing that the rooms belong to multiple teachers.
38. (B) "Their" is the correct possessive pronoun, and "there" indicates a direction.
39. (A) The first blank indicates a habitual action (present simple tense: "tries"), while the second blank refers to a completed action in the past (simple past tense: "forgot").
40. (D) 'The old' is a class of people and takes a plural verb; 'verb+ing' is used after 'cannot help.'

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Section 2 :

Explanation:

1. (C) As ΔDEF is an isosceles triangle, $\angle DEF = \angle DFE = 65^\circ$

$$\angle D = 180^\circ - 65^\circ - 65^\circ = 50^\circ$$

The central angle is twice the inscribed angle so, $\angle y = 2 \times 50^\circ = 100^\circ$

2. (B) Let, radius of first circle is x cm.

So, the diameter of first circle is $2x$.

$$2x = 8 \Rightarrow x = 4 \text{ cm.}$$

Radius of another circle is 4 cm

So, the distance between the centers of the circles is, $s = 4 + 4 = 8 \text{ cm.}$

3. (B) We know, $S_n = \frac{a(1 - r^n)}{1 - r}$

$$\text{So, } S_7 = 2 \times \frac{1 - (-2)^7}{1 - (-2)} = 2 \times \frac{1 - (-128)}{1+2} = 2 \times \frac{129}{3} = 86$$

4. (D) Here, number of sides, $n = 5$. The sum of total interior angles $= (n - 2) \times 180^\circ = (5 - 2) \times 180^\circ = 540^\circ$.

5. (B) Equation of the straight line, $\frac{x+2}{-2-0} = \frac{y-0}{0+2} \Rightarrow \frac{x+2}{-2} = \frac{y}{2} \Rightarrow x + 2 = -y \Rightarrow x + y = -2$. The line is dotted so the inequality sign will be $<$ or $>$

Substitute $(0,0)$ in the equation: $0 + 0 > -2$, the point $(0, 0)$ is above the line. As the graph shows shaded region below the line so, $x + y < -2$

6. (D) $f\left(\frac{1}{x^2}\right) = \frac{\left(\frac{2}{x^2}\right)+1}{\left(\frac{2}{x^2}\right)-1} = \frac{2+x^2}{2-x^2}$. Therefore, $\frac{f\left(\frac{1}{x^2}\right)+1}{f\left(\frac{1}{x^2}\right)-1} = \frac{\frac{2+x^2}{2-x^2}+1}{\frac{2+x^2}{2-x^2}-1} = \frac{\frac{2+x^2+2-x^2}{2-x^2}}{\frac{2+x^2-2-x^2}{2-x^2}} = \frac{2}{x^2}$

7. (A) $\frac{(5)^{-1} \cdot a \cdot 5}{5a \cdot 5^{-1}} = \frac{\left(\frac{1}{5}\right) \cdot a \cdot 5}{\left\{5a \cdot \left(\frac{1}{5}\right)\right\}} = \frac{5a}{5a} = 1$

8. (C) $(A \cup B) = \{1, 2, 3, 4, 6, 9\}$

$$U - (A \cup B) = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} - \{1, 2, 3, 4, 6, 9\} = \{5, 7, 8\}$$

9. (D) by option testing.

10. (D) In the table, column of (61–70) has the highest number which is 12. So, (61–70) will be the mode of the table.

11. (D) Let, the age of father is F years and the age of the son is S years.

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So, 7 years ago their ages were $F-7$ and $S-7$ years respectively.

by solving (1) and (2), we get; $F = 47$, $S = 23$

after 5 years, fathers age will be, $F + 5 = 47 + 5 = 52$ and sons age will be, $S + 5 = 23 + 5 = 28$

So, the ratio = $\frac{52}{28} = \frac{13}{7} = 13 : 7$

$$12. (C) \frac{(x+1)+y}{2} = 5x \Rightarrow 10x = (x + 1) + y \Rightarrow 9x - y = 1 \Rightarrow y = 9x - 1$$

13. (B) let the common fraction of each angle is x .

We know, the sum of the 3 angles of a triangle is 180°

$$\text{So, } 3x + 4x + 5x = 180^\circ \Rightarrow 12x = 180^\circ \Rightarrow x = 15$$

So, the smallest angle will be $3x = 3 * 15 = 45^\circ$

$$14. (B) a^x = b \Rightarrow (c^z)^x = b \Rightarrow (b^y)^{\{xz\}} = b \Rightarrow b^{\{xyz\}} = b^1 \Rightarrow xyz = 1$$

$$\text{So, } 2xyz = 2 * 1 = 2$$

15. (D) buying price of 30 books = 100 taka

So, buying price of 1 book = $\frac{100}{30} = \frac{10}{3}$ takas

Selling price of 1 book = 22 taka

$$\text{Profit} = \text{SP} - \text{BP} = 22 - \frac{10}{3} = 18.667 \text{ taka}$$

$$16. \text{ (A) We know, } a^2 - b^2 = (a + b)(a - b)$$

$$\text{Now, } a + b = \tan x + \sin x + \tan x - \sin x = 2\tan x$$

$$a - b = \tan x + \sin x - \tan x + \sin x = 2\sin x$$

$$a^2 - b^2 = 2\tan x \times 2\sin x = 4\tan x \sin x$$

$$17. (A) 2x^2 + 3 = 0 \Rightarrow 2x^2 = -3 \Rightarrow x^2 = -\frac{3}{2} \Rightarrow x = \frac{\sqrt{3}i}{\sqrt{2}} = \frac{\sqrt{3}i \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} = \sqrt{6} \frac{i}{2}$$

$$18. (D) y = 2x^2 - 8x + 8 = 2(x^2 - 4x + 4) = 2(x - 2)^2 = 2[f(x)]^2$$

$$19. (A) \quad 2 \begin{vmatrix} 3 & 2 \\ -9 & -7 \end{vmatrix} + \begin{vmatrix} 1 & -3 \\ -1 & 2 \end{vmatrix} - 2 \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} 6 & 4 \\ -18 & -14 \end{vmatrix} + \begin{vmatrix} 1 & -3 \\ -1 & 2 \end{vmatrix} - \begin{vmatrix} 2 & 0 \\ 0 & 2 \end{vmatrix}$$

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$$\Rightarrow \begin{vmatrix} 6+1-2 & 4-3-0 \\ -18-1+0 & -14+2-2 \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} 5 & 1 \\ -19 & -14 \end{vmatrix}$$

20. (A) 50 ducks eat for 5 days $\Rightarrow (50 + 25)$ ducks eat for $\frac{50 \times 5}{75} = 3.33$ days.

21. (D) Formula for the volume of a sphere is; $V = \frac{4}{3}\pi r^3$ and the formula for surface area is; $A = 4\pi r^2$. So the ratio $= \left(\frac{4}{3}\pi r^3\right) : 4\pi r^2 = r : 3$

22. (B) let, the number of the benches is x. From the discussion above we can say,

$$4 \times (x - 3) = 60 \Rightarrow x - 3 = \frac{60}{4} = 15 \Rightarrow x = 18.$$

23. (D) 1st 6 prime numbers are 2, 3, 5, 7, 11, 13

$$\text{Sum of the 1st 6 prime numbers} = 2 + 3 + 5 + 7 + 11 + 13 = 41$$

24. (D) The numbers are x, x + 2, x + 4, x + 6 and x + 8.

$$x + x + 2 + x + 4 + x + 6 + x + 8 = 235 \Rightarrow 5x + 20 = 235 \Rightarrow x = 43$$

The numbers are 43, 45, 47, 49 and 51. Here 43 and 47 are the prime numbers.

25. (C) $\cos\theta = \frac{4}{5} = \frac{\text{base}}{\text{hypotenuse}}$; Base = 4, Hypotenuse = 5. Perpendicular = $\sqrt{\text{Hypotenuse}^2 - \text{Base}^2}$

$$= \sqrt{5^2 - 4^2} = 3. \cot\theta = \frac{\text{base}}{\text{perpendicular}} = \frac{4}{3}$$

26. (A) If number of elements are n, number of proper subsets = $2^n - 1$

Here, n = 3. Number of proper subsets = $2^3 - 1 = 7$

27. (B) $\sin 0^\circ \cdot \sin 1^\circ \cdot \sin 2^\circ \dots \sin 90^\circ = 0 \cdot \sin 1^\circ \cdot \sin 2^\circ \dots \sin 90^\circ = 0$

28. (E) $\log_5(125\sqrt{5}) = \log_5\left(5^3 \cdot 5^{\frac{1}{2}}\right) = \log_5\left(5^{3+\frac{1}{2}}\right) = \log_5\left(5^{\frac{7}{2}}\right) = \frac{7}{2} \cdot \log_5 5 = \frac{7}{2}$

29. (B) In 500 spins, a bicycle wheel covers 10 km = 10,000 m

$$\therefore \text{In 1 spin, it covers } \frac{10000}{500} \text{ m} = 20 \text{ m}$$

$$\text{Circumference of the wheel, } 2\pi r = 20 \Rightarrow r = \frac{20}{2\pi} = \frac{10}{\pi} \text{ m}$$

30. (C) Let, the number be x. So, $\frac{3}{4}x = 4x - 2 \Rightarrow 3x = 16x - 8 \Rightarrow 13x = 8 \Rightarrow x = \frac{8}{13}$

31. (B) $\frac{1}{8} = 0.125, \frac{5}{6} = 0.83, \frac{5}{8} = 0.625, \frac{2}{5} = 0.4$ and $\frac{1}{25} = 0.04$.

Here, $0.83 = \frac{5}{6}$ is the largest value.

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32. (A) Area of the rectangle = $(6 \times 4) = 24$; Area of the circle = $\pi r^2 = 3.14 \times (2)^2 = 12.56$

Area of the shaded region = $24 - 12.56 = 11.44$

33. (B) Let the side of the square fields be x meters.

A.T.Q. $(x + 5 \times 2)^2 - x^2 = 500 \Rightarrow x^2 + 20x + 100 - x^2 = 500 \Rightarrow 20x = 400 \Rightarrow x = 20$

Area of the field = $x^2 = (20)^2 = 400$

34. (C) $f(-1) = (-1)^3 - 6(-1)^2 - 13(-1) + 1 = 7$

35. (B) $x^2 - 4x + 2^2 + y^2 - 6y + 3^2 = -c + 2^2 + 3^2 \Rightarrow (x - 2)^2 + (y - 3)^2 = -c + 13$

$$x = (2, 3).$$

36. (A) $\frac{1}{a} = \frac{1}{\sqrt{7}+\sqrt{6}} = \frac{\sqrt{7}-\sqrt{6}}{(\sqrt{7}+\sqrt{6})(\sqrt{7}-\sqrt{6})} = \sqrt{7} - \sqrt{6} \Rightarrow a + \frac{1}{a} = (\sqrt{7} + \sqrt{6}) + (\sqrt{7} - \sqrt{6}) = 2\sqrt{7}$

37. (C) $2(3x + 7x) = 150 \Rightarrow 6x + 14x = 150 \Rightarrow 20x = 150 \Rightarrow x = 7.5$

$$\text{length} = 3 \times 7.5 = 22.5$$

$$\text{width} = 7 \times 7.5 = 52.5$$

$$\text{Area} = 52.5 \times 22.5 = 1181.25$$

38. (B) Initial = $h^2 + d^2 = 20^2$; new = $(h - 4)^2 + d^2 \Rightarrow$ after the ladder slides $h = 20 - 4 = 16$
 $16^2 + d^2$ new = $20^2 \Rightarrow 256 + d^2 = 400 \Rightarrow d^2 = 144 \Rightarrow d = 12$.

39. (D) $485 = 8 + (n - 1) \times 3 \Rightarrow 485 - 8 = 3(n - 1) \Rightarrow 477 = 3(n - 1) \Rightarrow n - 1 = 159 \Rightarrow n = 160$

40. (A) $128 = 2^7 \Rightarrow 4^{x+2} = 2^{2(x+2)} = 2^{2x+4} = 2^7 \Rightarrow 2x + 4 = 7 \Rightarrow x = \frac{3}{2}$

41. (D) Total number of possible outcomes = $6 \times 6 = 36$

Favorable outcomes = $(1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1) \Rightarrow P(A) = \frac{6}{36} = \frac{1}{6}$

The probability of getting sum as 7 when two dice are thrown is $\frac{1}{6}$.

42. (B) The formula for the volume of a cylinder is $V = h\pi r^2$

we just need to plug in values and simplify, $V = 15 \times \pi \times 25 \Rightarrow V = 375\pi$

43. (B) By option checking:

$$2(1) + 3(1) - 5 = 0 \text{ and } 4(1) - 1(1) - 3 = 0$$

44. (B) $\angle x + \angle y = 180^\circ - 67^\circ = 113^\circ$

45. (A) $|x + 2| + |x - 6| = |-7 + 2| + |-7 - 6| = |-5| + |-13| = 18$

46. (C) $180 = 3 \times 4 \times x \Rightarrow x = 180/12 = 15 \Rightarrow$ Required numbers = $3 \times 15 = 45, 4 \times 15 = 60$

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47. (A) $AB^2 = BE^2 - AE^2 \Rightarrow AB = \sqrt{85^2 - 36^2} \Rightarrow AB = 77$

Area = $\frac{1}{2} \times (57 + 77) \times 36 = 2412$

48. (E) Let the other number = y.

Therefore, $\frac{x+1+y}{2} = 5x \Rightarrow 10x - x - 1 = y \Rightarrow y = 9x - 10$. $10x - (x + 1) = 9x - 1$

49. (B) $2x - 3 > x + 5 \Rightarrow 2x - x > 5 + 3 \Rightarrow x > 8$

50. (B) For the point, $(x, -5)$, the y-coordinate will always be -5 . Therefore, we'll get a line parallel to the x-axis at $y = -5$. So, the point $(x, -5)$ will be on the line $y = -5$.



Summer 2025

Section 1: English Grammar and Vocabulary

1. I am looking for _____ to cut the ribbon.
A. A pair scissors **B. Scissors** C. Some scissors D. A scissors
2. The captain skillfully _____ the ship into the harbor.
A. Rode B. Drove **C. Steered** D. Stalled
3. “Alternatively” means _____.
A. Generally **B. Optionally** C. Similarly D. Commonly
4. A _____ journey left us exhausted by the time we reached the village.
A. Three-hour B. Three-hours C. Three-hour D. Threes-hours
5. Because of his _____ habits in the village, it is hard for him to live in Baridhara.
A. Rustic B. Rural C. Modern D. Sophisticated
6. Which of the following is correct:
A. Rina is as taller as Tina.
B. Rina is not as tall as Tina.
C. Rina is tallest as Tina.
D. Rina is more tall than Tina.
7. Choose the correct sentence from the following:
A. They were playing badminton; their shuttle got stuck in a tree.
B. They were playing, badminton there shuttle got stuck in a tree.
C. They were playing badminton, their shuttle got stuck in a tree.
D. They were playing, badminton their shuttle, got stuck in a tree.
8. The coffee shop is right _____ the street.
A. By B. With **C. Across** D. Along
9. I had kept the book on the table. How did you find it from _____ the table?
A. Over B. In **C. Under** D. Along
10. I was walking to class when I saw _____ European man holding _____ ice-cream.
A. A, the B. An, a **C. A, an** D. The, the

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11. The principal, along with the teachers, _____ reluctant to give permission for the tour.
- A. Is B. Will C. Are D. Were
12. Either Anna or Angela _____ the biscuits from the container.
- A. Stole B. Have stolen C. Steal D. Stolen
13. He was waiting there for ten hours. Ten hours _____ a long time.
- A. Is B. Will be C. Are D. Were
14. He was _____ tired to study after returning from school.
- A. Too B. Two C. To D. Onto
15. If I studied harder, I _____ good grades in the exam.
- A. Get B. Would get C. Would have gotten D. Got
16. I would have been in Japan right now if I _____ to that university.
- A. Apply B. Would have applied
C. Had applied D. Applied
17. The police _____ looking for the criminal.
- A. Is B. Have been C. Has been D. Was
18. If I _____ there now, will I get to meet the chairman?
- A. Go B. Went C. Gone D. Going
19. She was _____ the moon when she heard the news.
- A. Over B. In C. Under D. On
20. The teacher said that there should be equal contribution _____ the project.
- A. To B. In C. With D. On
21. The flood _____ thousands of people.
- A. Effected B. Defected C. Reflected D. **Affected**
22. A _____ were seen flying. There must be a carcass nearby.
- A. Wake of vulture B. Flock of vulture
C. Committee of vulture D. **Kettle of vulture**
23. She did not go to school today, _____ she was feeling ill.
- A. Because. B. Because, C. Because; D. **Because**
24. Call the ambulance! There is _____ accident.

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A. A B. An C. The D. None

25. What is called the meat of a deer?

A. Mutton B. Veil C. Beef D. Venison

26. The family members _____ talking to each other for 10 years due to property disputes regarding property distribution.

A. Ceased B. Seized C. Sieged D. Sized

27. All of the boys _____ in the same team.

A. Play B. Plays C. Is playing D. Played

28. Neither the car seats nor the brakes _____ the driver.

A. Is annoying B. Annoys C. Annoy D. Annoying

29. Either Nanny or her sisters _____ supposed to make some dessert.

A. Is B. Were C. Was D. Would

30. Would you mind waiting for _____ minutes?

A. A few B. A few C. Little D. Less

31. Would you consider inviting Tina if she _____ to be more polite during dinner?

A. Was B. Were C. Would be D. Will be

32. I would not sleep if I _____ to bed right now.

A. Went B. Go C. Going D. Will go

33. She has been ill _____ yesterday.

A. Went B. For C. Since D. Will go

34. She is loud and obnoxious; _____, she is fun to be around.

A. Yet B. Although C. Despite D. Nevertheless

35. She prefers Chinese food _____ Japanese food.

A. Rather B. Than C. Over D. For

36. He is too big to _____ the bus.

A. In B. On C. By D. To

37. I can see his address _____ the computer screen.

A. In B. On C. To D. For

38. Safety is a priority. _____ safety should come first.

A. People B. People's C. People D. Peoples'

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39. Ms. Smith, she is an aunt of _____.

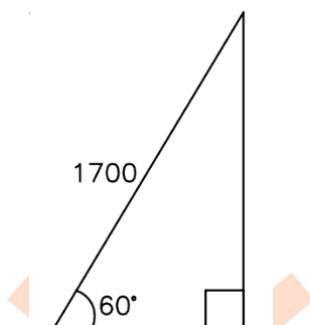
- A. Lulu B. Lulus C. Lulu's D. Lulus'

40. The Jones _____ grass.

- A. Cut their B. Cut its C. Cuts their D. Cuts its

Section 2: Quantitative Aptitude

1.



The angle of elevation of the top of the Eiffel Tower at a point on the ground is 60° . The direct distance from the point to the top of the tower is 1700 m. What is the height of the tower?

- A. 850 B. $850\sqrt{3}$ C. $\sqrt{3}$ D. 12 E. 21.23

2. The distance between two countries in a map is 9.25 cm. If the conversion ratio is $1 : 200000$, then what is the real distance between the countries?

- A. 18.5 m B. 18.5 km C. 10 km D. 18 km E. 18.23 km

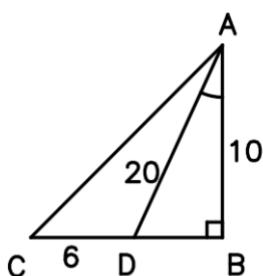
3. If $x^p = y$, $y^q = z$ & $z^r = x$, then $pqr = ?$

- A. 10 B. p C. 1 D. 20 E. 0

4. The mean of x & y is 13 and the mean of p & q is 21. What is the average of x, y, p & q?

- A. 18 B. 17 C. 19 D. 1.78 E. 11.2

5.



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If $\angle BAD = 30^\circ$, what is the area of ΔACD ?

- A. 10 B. 17 C. $30\sqrt{3}$ D. $\sqrt{3}$ E. 30

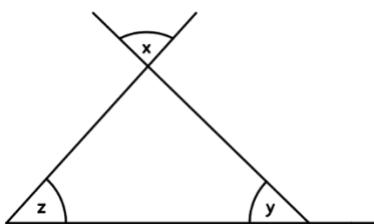
6. If $a + b = 12$ & $ab = 32$, then $a, b = ?$

- A. 32, 1 B. 16, 2 C. 6, 6 D. 10, 2 E. 8, 4

7. Difference between a two-digit number & the number after altering the digits will be divisible by-

- A. 10 B. 3 C. 2 D. 4 E. 8

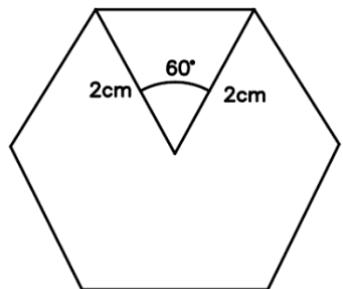
8.



If $x + y = 105^\circ$, $z = ?$

- A. 32° B. 25° C. 12° D. 120° E. 75°

9.



What is the area of the following hexagon?

- A. $\sqrt{3} \text{ cm}^2$ B. $6\sqrt{3} \text{ cm}$ C. $6\sqrt{3} \text{ cm}^2$ D. $6\sqrt{3} \text{ m}^2$ E. $5\sqrt{3} \text{ cm}^2$

10. If $a + b + c = 10$, $ab + bc + ca = 22$, then $a^2 + b^2 + c^2 = ?$

- A. 56 B. 32 C. 23 D. 12 E. 11

11. If the points $(-4, 2)$, $(1, k)$ & $(5, 20)$ are on the same line, then what is the value of k ?

- A. 10 B. 12 C. 5 D. 22 E. 0

12. What is the slope of the line passing through $(10, 4)$ & $(4, 8)$?

- A. $-\frac{2}{3}$ B. $\frac{3}{23}$ C. $\frac{3}{2}$ D. $\frac{2}{3}$ E. $-\frac{3}{2}$

13. If $A = 8 + 5i$ & $B = 3 + 8i$, then $A + B = ?$

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- A. $10 + 13i$ B. $11 + 13i$ C. $13 + 11i$ D. $12 + i$ E. $2 + 40i$

14. The sum of two numbers is 20 & their product is 96, then what are the numbers?

- A. 2, 8 B. 8, 9 C. **12, 8** D. 14, 8 E. 10, 1

15. What is the slope of the line that is perpendicular on the line passing through $(2, -6)$ & $(-10, 9)$?

- A. $\frac{5}{4}$ B. $-\frac{4}{5}$ C. $-\frac{5}{4}$ D. -1 E. $\frac{4}{5}$

16. What is the LCM of 45, 60 & 80?

- A. 2160 B. 216 C. 7200 D. **720** E. 100

17. $f(x) = x$ and $g(x) = x^2$. Then $fog(-4) = ?$

- A. 21 B. **16** C. 10 D. 9 E. 100

18. What is the mean of numbers from 1 to 100?

- A. 50 B. **50.5** C. 1 D. 51 E. None

19. Which equation represents the circle with centre $(2, -1)$ and radius 5?

- A. $(x - 2)^2 + (y + 1)^2 = 25$ B. $(x + 2)^2 + (y - 1)^2 = 25$ C. $x^2 + y^2 - 4x + 2y = 20$
D. $x^2 + y^2 + 4x - 2y = 25$ E. $(x - 2)^2 + (y + 1)^2 = 5$

20. The slope of the line parallel to $3x - 4y + 7 = 0$ is:

- A. $\frac{3}{4}$ B. $-\frac{3}{4}$ C. 5 D. $-\frac{4}{3}$ E. $\frac{1}{7}$

21. Find the maxima of the equation $(x + 1)(3 - x)$

- A. 1 B. 0 C. -4 D. 4 E. None

22. Solve $|x + 1| < 3$.

- A. $-4 < x < 2$ B. $-2 < x < 4$ C. $-3 < x < 1$
D. $-3 < x < 3$ E. $-5 < x < 1$

23. $f(x)$ is a function where $f(x) = x^4 - 2x^3 + x - 11$ then what is the value for $f(2) = ?$

- A. 21 B. 8 C. **-9** D. 14 E. 7

24. The distance between the points $(2, 3)$ and $(-1, -1)$ is:

- A. **5** B. 2 C. 4 D. 8 E. 3

25. One card is drawn at random from a standard 52-card deck. The probability it is a face card is:

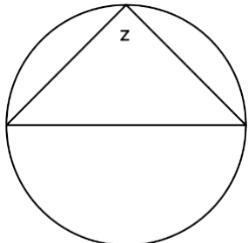
- A. 141 B. $\frac{3}{13}$ C. $\frac{3}{34}$ D. 11 E. 12

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26. In a class, 41% students like Mathematics, 27% students like English and 14% students like both of the subjects. How many students do not like any subject?

- A. 34 **B. 46** C. 56 D. 0 E. 22

27.



What is the value of z ?

- A. 90 B. 45 C. 60 D. 12 E. Can not be determined

28. If $90^\circ < \theta < 180^\circ$, what is the value of $\tan \theta$?

- A. Negative **B. Positive** C. 0 D. Undefined E. None

29. What is the perimeter of an equilateral triangle with area $4\sqrt{3}$ square units?

- A. 3 B. $8\sqrt{3}$ **C. 12** D. $4\sqrt{3}$ E. $2\sqrt{3}$

30. What is the value of $\ln e^{\{2x-3\}} + 3$?

- A. $2x$** B. $\ln(2x - 3)$ C. $\ln(2x + 3)$ D. -3 E. $2x - 3$

31. What is the next term in the series: 1, 8, 27...?

- A. 1 B. 23 **C. 64** D. 14 E. 29

32. If you pour 12 L of water into an aquarium that has the length 40 cm, width 30 cm & height 50 cm, then what will be the height of water in the aquarium? ($1 \text{ L} = 1000 \text{ cm}^3$).

- A. 48 cm **B. 10 cm** C. 50 cm D. 60 cm E. 19 cm

33. $\log_a 64 = 2$, then $a = ?$

- A. 64 B. 32 C. 14 **D. 8** E. 1

34. How many prime numbers are in the inequality $p - 5 \leq 20 \leq 3p - 1$?

- A. 2 B. 3 C. 4 D. 5 **E. 6**

35. If $y = \ln x$, then $e^y = ?$

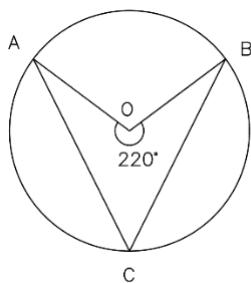
- A. ex B. $\ln y$ C. e **D. x** E. y

36. A man ran 30 min at 6 km ph & then he walked 30 minutes at 3 km ph. What's his total travelled distance?

- A. 9 km B. 270 m C. 270 km **D. 4.5 km** E. 12 km

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37.



$\angle ACB = ?$

- A. 10° B. 40° C. **70°** D. 80° E. 20°

38. If the sides of a triangle are 3, 4 & 5, then what is the area of the triangle?

- A. 6 B. 14 C. 12 D. 9 E. 11

39. If $i = \sqrt{-1}$, then what are the roots of $x^2 - 2x + 5 = 0$?

- A. $1 + 2i$ B. $1 - 2i$ C. **$1 \pm 2i$** D. $2i$ E. $2 - i$

40. Ehsan completes a work in 10 days. Simon takes 5 days more than him. If they work together, then how many days will be required for them to complete the work?

- A. 10 B. **6** C. 21 D. 12 E. 18

41. If two dice are rolled together, then what is the probability of getting a prime number in both of the dice?

- A. $\frac{11}{2}$ B. $\frac{1}{4}$ C. $\frac{1}{10}$ D. $\frac{1}{6}$ E. $\frac{1}{5}$

42. If $x : y = 5 : 3$, then $\frac{x^2 + y^2}{x^2 - y^2} = ?$

- A. $\frac{17}{8}$ B. $\frac{17}{9}$ C. $\frac{1}{8}$ D. $\frac{17}{2}$ E. $\frac{17}{10}$

43. A certain amount of money is divided among a, b & c in the ratio of 3 : 5 : 7. If b gets 6\$ less than c, then what is the amount received by a?

- A. 12 B. 6 C. 10 D. 8 E. **9**

44. When a cube's side is increased by 25%, then its volume becomes 19. What's the original length of the side?

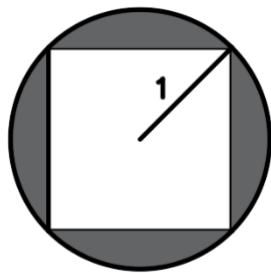
- A. 3.1 B. **2.1** C. 4.1 D. 3.4 E. None

45. A satellite generate electricity according to the function $E(t) = 50 e^{1.1t}$ where $E(t)$ represents the amount of electricity in watts. How much electricity does satellite generate at the start?

- A. 20 watt B. 30 watt C. **50 watt** D. 70 watt E. None

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46.



What is the area of the shaded region?

- A. 2 B. $\pi - 2$ C. $\frac{\pi - 2}{4}$ D. $\frac{2\pi - 1}{2}$ E. $\frac{(\pi - 2)}{12}$

47. A boat goes at 3 km ph upstream. If the stream is 5 km ph, then what's the required time to cross 52 kmph downstream?

- A. 17.8 h B. 4 h C. 360 min D. 240 h E. 30 min

48. If ${}^nC_r = \frac{n!}{[r!(n-r)!]}$ then what is the value of $\frac{8!}{4! \times 3!} = ?$

- A. 280 B. 28 C. 56 D. 12 E. 11

49. If $f(x) = \frac{x^2 + x + 1}{x}$, then $f\left(\frac{1}{x}\right) = ?$

- A. $1 + x + x^2$ B. x C. $\frac{x^2 + x + 1}{x}$ D. $x + 1$ E. $2 + x + x^2$

50. Find the value of x: $\frac{1}{(x-1)} + \frac{1}{x-2} = \frac{1}{x} + \frac{1}{x-3}$

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

Summer-25-Solution

Section 1: English Grammar and Vocabulary

Explanations:

- (B) "Scissors" is appropriate as it is a tool to cut a ribbon.
- (C) "Steered" means guiding the course of a vessel or vehicle, which is appropriate for a ship.
- (B) Alternatively - offering another option or choice; optionally.
- (A) When a time unit is used as an adjective before a noun, it becomes singular.

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5. (A) Rustic - refers to simple, traditional, countryside-like habits. "Rural" is used to indicate areas or places.
6. (B) Follows the correct positive sentence structure.
7. (A) (;) is appropriate as it connects two closely related independent clauses.
8. (C) "Across" is the correct preposition here.
9. (C) "Under" is the correct preposition here. It indicates that the book was found under the table.
10. (C) We use "a" before words starting with a consonant sound and "an" before words starting with a vowel sound.
11. (A) When "along with" is used, the verb usually agrees with the first subject mentioned.
12. (A) If singular subjects are connected by "Either...or" then the verb will also be singular.
13. (A) "Ten hours" is singular.
14. (A) Too - indicates the intensity.
15. (B) According to the 2nd conditional, If + past simple, would + base verb.
16. (C) According to the 3rd conditional, If + past perfect, would have + past participle.
17. (B) When sentences have subjects like police, news, scissors, mathematics, etc. (nouns that are plural by default), the verb should be plural.
18. (A) According to the first conditional, If + present simple, will + base verb.
19. (A) Over the moon - overjoyed.
20. (A) "Contribution" - means to give or provide something.
21. (D) Affected - to influence or cause a change in something.
22. (D) Kettle - refers to a group of vultures flying in circles in the sky. Wake - refers to a group of vultures feeding on a carcass.
23. (D) No punctuation is needed with "because," as it functions as a subordinating conjunction here.
24. (B) "Accident" begins with a vowel sound (a), so we use "an" before it.
25. (D) Venison is the meat of a deer.
26. (A) Ceased - to come or bring to an end.
27. (A) "All of the boys" indicates a plural subject and takes a plural verb with it.
28. (C) If the sentences start with "either...or," "neither...nor," etc., the verb will agree with the subject closest to it.
29. (B) "A few" is used with countable nouns like minutes, apples, books, etc.

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30. (B) This is an example of a second conditional: If + past simple (or subjunctive), would + base verb. The subjunctive mood will be used here since it indicates a hypothetical or unreal situation.
31. (B) This is an example of a second conditional: If + past simple, would + base verb.
32. (A) This is an example of a second conditional: If + past simple, would + base verb.
33. (C) "Since" indicates a specific point in time, which is "yesterday."
34. (D) "Nevertheless" is the appropriate conjunction to add to two contrasting clauses.
35. (C) "Over" is a preposition indicating a comparison or preference between two things.
36. (B) "On the bus" is appropriate when talking about getting onto or being inside public transport.
37. (B) "On" is used when referring to information displayed on surfaces.
38. (C) "People's" is appropriate here as it indicates possession.
39. (A) "Lulu's" is the appropriate possessive form, which indicates the aunt of Lulu.
40. (A) "The Jones" refers to a family, which is a plural subject and takes a plural verb after it.

Section 2: Quantitative Aptitude

Explanation:

1. (B) $\sin 60^\circ = \frac{h}{1700} \Rightarrow \frac{\sqrt{3}}{2} = \frac{h}{1700} \Rightarrow h = 1700 \cdot \frac{\sqrt{3}}{2} = 850\sqrt{3}$

2. (B) Real distance = $9.25 \times 200000 = 1850000$ cm = $\frac{1850000}{100} = 18500$ m = $\frac{18500}{1000} = 18.5$ km

3. (C) $x^p = y, y^q = z \Rightarrow x^{\{pq\}} = z, z^r = x \Rightarrow (x^{\{pq\}})^r = x \Rightarrow x^{\{pqr\}} = x \Rightarrow pqr = 1$

4. (B) Mean of 4 numbers = $\frac{x+y+p+q}{4}$. Given the mean of x & y is 13 and the mean of p & q is 21. So, $x+y=26$ and $p+q=42 \Rightarrow x+y+p+q=68 \Rightarrow \frac{x+y+p+q}{4}=17$

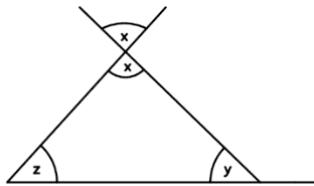
5. (C) In the triangle ΔABD , $\cos \angle BAD = \frac{AB}{20} \Rightarrow AB = \cos \angle BAD \times 20 = \cos 30^\circ \times 20 = 10\sqrt{3}$. In the triangle ΔACD , height, $AB = 10\sqrt{3}$; base, $CD = 6$. Area of $\Delta ACD = \frac{1}{2} \times AB \times CD = \frac{1}{2} \times 10\sqrt{3} \times 6 = 30\sqrt{3}$

6. (E) $ab = 32 \Rightarrow b = \frac{32}{a}$. Then, $a + b = 12 \Rightarrow a + \frac{32}{a} = 12 \Rightarrow a^2 - 12a + 32 = 0 \Rightarrow (a-8)(a-4) = 0 \Rightarrow a = 8, 4$ ($b = 4, 8$)

7. (B) Let 'a' be the tens digit and 'b' be the units digit. Difference = $(10a + b) - (10b + a) = 9(a - b)$; It is always divisible by 3 and 9

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8. (E)



Here, $x + y + z = 180^\circ \Rightarrow 105^\circ + z = 180^\circ \Rightarrow z = 75^\circ$

9. (C) Area of hexagon $= 6 \times \left(\frac{\sqrt{3}}{4}\right) \times 2^2 = 6\sqrt{3} \text{ cm}^2$

10. (A) $a^2 + b^2 + c^2 = (a + b + c)^2 - 2(ab + bc + ca) = 10^2 - 2 \times 22 = 56$

11. (B) If the points are on the same line, slopes between any two pairs will be equal. So, $\frac{k-2}{-1-(-4)} = \frac{20-k}{5-1} \Rightarrow \frac{k-2}{5} = \frac{20-k}{4} \Rightarrow 4k - 8 = 100 - 5k \Rightarrow 9k = 108 \Rightarrow k = 12$

12. (A) Slope $= \frac{8-4}{4-10} = \frac{4}{-6} = -\frac{2}{3}$

13. (B) $A + B = (8 + 5i) + (3 + 8i) = 11 + 13i$

14. (C) Let, one of the numbers be x . Other number $= \frac{96}{x}$ as their product is 96. A.T.Q. $x + \frac{96}{x} = 20 \Rightarrow x^2 - 20x + 96 = 0 \Rightarrow (x - 12)(x - 8) = 0 \Rightarrow x = 12, 8$. (Or do the option-check method.)

15. (E) Slope of the given line, $m_1 = \frac{9 - (-6)}{-10 - 2} = \frac{15}{-12} = -\frac{5}{4}$. Let the slope of the perpendicular line m_2 . $m_1 m_2 = -1 \Rightarrow m_2 = \frac{4}{5}$

16. (D) Prime factorization for each number: $45 = 3^2 \times 5$; $60 = 2^2 \times 3 \times 5$; $80 = 2^4 \times 5$. LCM($45, 60, 80$) $= 2^4 \cdot 3^2 \cdot 5 = 720$

17. (B) $(fog)(x) = f(g(x)) = f(x^2) = (-4)^2 = 16$

18. (B) As this is arithmetic progression, mean $= \frac{1+100}{2} = 50.5$

19. (A) $(x - h)^2 + (y - k)^2 = r^2$. Here, centre $(h, k) = (2, -1)$; radius, $r = 25$. So, the equation will be: $(x - 2)^2 + (y + 1)^2 = 25$

20. (A) The slope of the given line $= -\frac{\text{coefficient of } x}{\text{coefficient of } y} = \frac{3}{4}$. The slope of its parallel line is same which is $\frac{3}{4}$

21. (D) $f(x) = (x + 1)(3 - x) = 3x - x^2 + 3 - x = -x^2 + 2x + 3$. If we compare this with $f(x) = ax^2 + bx + c$; $a = -1 < 0$; $b = 2$; $c = 3$. Vertex, $x = -\frac{b}{2a} = -\frac{2}{2(-1)} = 1$. Maxima of the equation, $f(1) = (1 + 1)(3 - 1) = 4$

22. (A) $|x + 1| < 3 \Rightarrow -3 < x + 1 < 3 \Rightarrow -4 < x < 2$

23. (C) $f(x) = x^4 - 2x^3 + x - 11 \Rightarrow f(2) = 16 - 16 + 2 - 11 = -9$

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24. (A) Distance = $\sqrt{\{(2 - (-1))^2 + (3 - (-1))^2\}} = \sqrt{3^2 + 4^2} = 5$

25. (B) $P(\text{face card}) = \frac{\text{Number of face cards}}{\text{Total number of cards}} = \frac{12}{52} = \frac{3}{13}$

26. (B) Let, number of total students = 100; Number of students who like Mathematics, A = 41; Number of students who like English, B = 27. Total = A + B - both + none \Rightarrow none = $100 - 41 - 27 + 14 = 46$

27. (A) A semicircle angle is always 90

28. (B) $\tan \theta$ is negative in the 2nd quadrant.

29. (C) Area = $\left(\frac{\sqrt{3}}{4}\right)a^2 \Rightarrow 4\sqrt{3} = \left(\frac{\sqrt{3}}{4}\right)a^2 \Rightarrow a^2 = 4\sqrt{3} \times \frac{4}{\sqrt{3}} = 16 \Rightarrow a = 4$. Perimeter = $3a = 3 \times 4 = 12$

30. (A) $\ln e^{2x-3} + 3 = (2x - 3) \ln e + 3 = (2x - 3) + 3 = 2x$

31. (C) $1 = 1^3, 8 = 2^3, 27 = 3^3 \therefore$ Next term = $4^3 = 64$

32. Volume = Base Area \times Height $\Rightarrow 12000 = 40 \times 30 \times h \Rightarrow 12000 = 1200 h \Rightarrow h = \frac{12000}{1200} = 10$ cm.

33. (D) $\log_a 64 = 2 \Rightarrow a^2 = 64 \Rightarrow a = 8$

34. (E) Given, $p - 5 \leq 20 \leq 3p - 1 \Rightarrow p - 5 \leq 20$ or $20 \leq 3p - 1 \Rightarrow p \leq 25$ or $7 \leq p \Rightarrow 7 \leq p \leq 25$. In this range, there are 6 prime numbers: 7, 11, 13, 17, 19, 23.

35. (D) $y = \ln x$, then $e^y = x$

36. (D) Total distance = $s_1 + s_2 = v_1 t_1 + v_2 t_2 = 6 \times \frac{30}{60} + 3 \times \frac{30}{60} = 4.5$ km

37. (C) Reflex $\angle AOB = 220^\circ$; Minor $\angle AOB = 360^\circ - 220^\circ = 140^\circ$. An inscribed angle half of the central angle that lies on the same arc. So, $\angle ACB = \frac{1}{2} \times 140^\circ = 70^\circ$

38. (A) 3, 4, and 5 are the lengths of a right-angle triangle where the height and base are 3, 4 and the hypotenuse is 5. Area = $\frac{1}{2} \times 3 \times 4 = 6$.

39. (C) $x = \frac{[-(-2) \pm \sqrt{(-2)^2 - 4(1)(5)}]}{2(1)} = \frac{2 \pm \sqrt{4 - 20}}{2} = \frac{2 \pm \sqrt{-16}}{2} = \frac{2 \pm 4i}{2} = 1 \pm 2i$

40. (B) Work in 1 day together = $\frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$. Total time taken = 6 days

41. (B) Probability = $\left(\frac{\text{No. of prime outcomes on one die}}{6}\right)^2 = \left(\frac{3}{6}\right)^2 = \frac{1}{4}$

42. (A) $x : y = 5 : 3$ therefore, Let, $x = 5k$ and $y = 3k$. $\frac{x^2 + y^2}{x^2 - y^2} = \frac{(5k)^2 + (3k)^2}{((5k)^2 - (3k)^2)} = \frac{25k^2 + 9k^2}{25k^2 - 9k^2} = \frac{34k^2}{16k^2} = \frac{17}{8}$

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43. (E) Let the shares be $3x : 5x : 7x$. According to the question, $7x - 5x = 6 \Rightarrow 2x = 6 \Rightarrow x = 3$
 $\Rightarrow A's share = 3x = 9$

44. (B) Let, original length of the side = x . After 25% increase, new length = $x + 25\% \text{ of } x = x + \frac{25x}{100} = 1.25x$. Volume = 19 $\Rightarrow (1.25x)^3 = 19 \Rightarrow x = \sqrt[3]{19} / 1.25 = 2.1$

45. (C) At the start, time, $t = 0$. Electricity produced at the start, $E(0) = 50e^{1.1 \times 0} = 50e^0 = 50 \text{ watt}$

46. (B) Radius = 1. So, diameter = $1 + 1 = 2$. Diagonal of the square = Diameter of the circle = 2. Side of the square = $\frac{2}{\sqrt{2}} = \sqrt{2}$. Area of shaded region = Area of circle - Area of square = $\pi(1)^2 - (\sqrt{2})^2 = \pi - 2$

47. (B) Let, boat speed b and stream speed s . Upstream speed = $b - s \Rightarrow 3 = b - 5 \Rightarrow b = 8$

8. Downstream speed = $b + s = 8 + 5 = 13$. Time = Distance/Speed = $\frac{52}{13} = 4 \text{ hours}$

48. (A) $\frac{8!}{4! \times 3!} = \frac{(8 \times 7 \times 6 \times 5 \times 4!)}{(4! \times 3 \times 2 \times 1)} = \frac{1680}{6} = 280$

$$49. (C) f\left(\frac{1}{x}\right) = \frac{\left(\frac{1}{x}\right)^2 + \left(\frac{1}{x}\right) + 1}{\left(\frac{1}{x}\right)} = \frac{1 + x + x^2}{x}$$

50. (D) By option testing,

$$\text{if we put } x = \frac{3}{2}; \text{ L.H.S} = \frac{1}{(x-1)} + \frac{1}{x-2} = \frac{1}{\left(\frac{3}{2}-1\right)} + \frac{1}{\frac{3}{2}-2} = 0.$$

$$\text{R.H.S} = \frac{1}{x} + \frac{1}{x-3} = \frac{1}{\left(\frac{3}{2}\right)} + \frac{1}{\frac{3}{2}-3} = 0 = \text{L.H.S. So, } x = \frac{3}{2}$$

Spring 2024

Section 2: Quantitative Aptitude

1. $\left(\frac{x^p}{x^q}\right)^{p+q} \times \left(\frac{x^q}{x^r}\right)^{q-r} \times \left(\frac{x^r}{x^p}\right)^{r+p} = ?$

- A. 1 B. 0 C. 2 D. $\frac{1}{2}$ E. None

2. Which of the following is the 9th term in the series $2^0, 2^{\frac{1}{2}}, 2^1, \dots?$

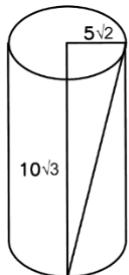
- A. 16 B. 64 C. 32 D. 256 E. None

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3. If $25\% \times 50 = x \times 15\%$, then $x = ?$

- A. 250 B. 520 C. $\frac{250}{3}$ D. 10 E. None

4.



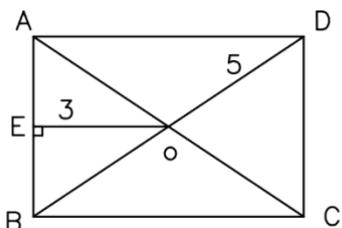
Volume of the cylinder = ?

- A. $50\pi\sqrt{350}$ B. 65π C. 527.39 D. 199.98 E. $500\pi\sqrt{3}$

5. There are 5 green balls, 3 blue balls, and 4 red balls. What is the probability of picking out 2 green balls randomly?

- A. $\frac{20}{30}$ B. $\frac{20}{132}$ C. $\frac{121}{132}$ D. $\frac{90}{12}$ E. None

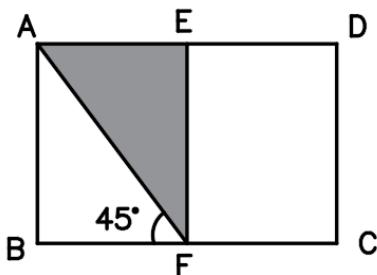
6.



$AB = ?$

- A. 6 B. 8 C. 4 D. 3 E. 5

7.



What is the area of the shaded part where EABF is a square and $AD = 30$ & E is the midpoint of AD?

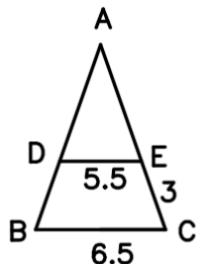
- A. 112.5 B. 130 C. 78.5 D. 35 E. 120

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8. Which is the 11th term in the series $3^0, 3^{\frac{1}{2}}, 3^1, \dots$?

- A. 16 B. 243 C. 32 D. 64 E. 256

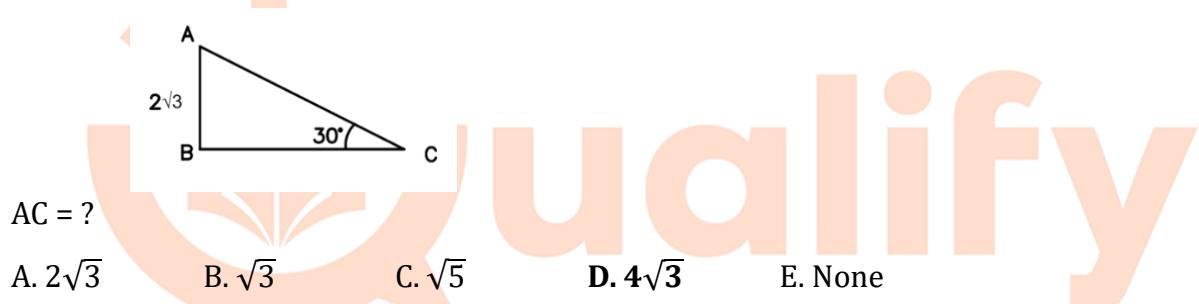
9.



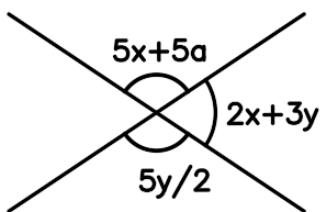
$AE = ?$

- A. $\frac{5}{11}$ B. 10.5 C. 16.5 D. 17.5 E. 20.5

10.



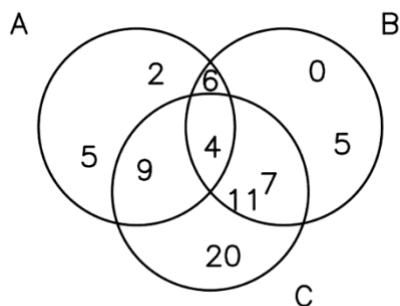
11. Find the value of a:



- A. $x - y$ B. $y - x$ C. $10x + 5y$ D. $\frac{1}{2}y - x$ E. $10x - 5y$

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12.

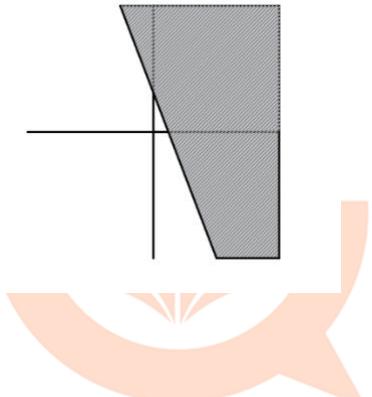


$$AU(B \cap C) = ?$$

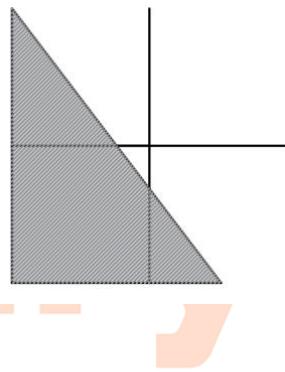
- A. {2, 5, 6, 7} B. {3, 5} C. {4} D. {2, 4, 5, 6, 7, 9, 11} E. None

13. Which of the following is the graph of $y > 2x + 5$?

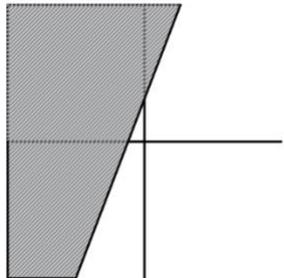
A.



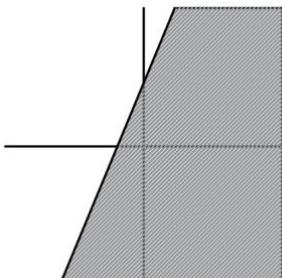
B.



C.

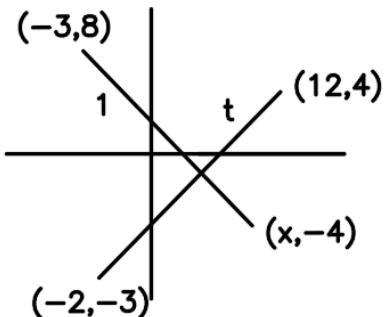


D..



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14. What is the value of x when t and l are perpendicular?



- A. 3 B. -3 C. 4 D. 2 E. None

15. Which of the following points satisfies the equations $x = y^3$ and $x = -y$?

- A. (1, 1) B. (2, 8) C. (1, 4) D. (-1, -1) E. (0, 0)

16. $\log_2 16\sqrt{8} = ?$

- A. $\frac{11}{2}$ B. $\frac{5}{2}$ C. $\frac{9}{8}$ D. 0 E. None

17. If $f(x) = \sqrt{2x^2 - 1}$, then $f(f(-2)) = ?$

- A. 9 B. 8 C. 13 D. $\sqrt{13}$ E. None

18. The present ratio of ages of A, B & C is 4:5:6. 18 years ago, this ratio was 11:16:21. Find the sum total of their present ages.

- A. 90 years B. 150 years C. 110 years D. 80 years E. None

19. $4(4^2)^x = 256$. Then $x = ?$

- A. $\frac{4}{3}$ B. $\frac{2}{3}$ C. $\frac{3}{2}$ D. $\frac{8}{9}$ E. None

20. x does 20 photocopies per minute while x and y together does 35 photocopies per minute. How many photocopies does y alone make in a minute?

- A. $\frac{1}{15}$ B. 30 C. 25 D. 15 E. None

21. If $3^m \sqrt{32} = 2^m$, then $m = ?$

- A. $\frac{2}{3}$ B. 1 C. $\sqrt{\frac{5}{3}}$ D. $\frac{1}{2}$ E. None

22. The price of 12g coffee is x taka. If 1g of coffee can make y cups of coffee, then which of the following is the appropriate equation for x and y?

- A. $12x = y$ B. $xy = 12$ C. $2x = y$ D. $x - 12y = 0$ E. None

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23. The ratio of the sum and the difference of two numbers is 11:1. Their multiplication result is 120. Find the smallest number.

- A. 10 B. 3 C. 28 D. 12 E. None

24. If $4^m\sqrt{81} = 3^m$, then m = ?

- A. $\frac{2}{3}$ B. -1 C. $\sqrt{\frac{5}{3}}$ D. $\frac{1}{2}$ E. None

25. Which of the following points satisfies the equations $xy = 1$ and $x + 2y - 3 = 0$?

- A. (1, -1) B. (2, 8) C. (1, 4) D. (1, -1) E. $(2, \frac{1}{2})$

26. A dice has been rolled 3 times in a row. What is the probability of getting a triple 6?

- A. $\frac{30}{20}$ B. $\frac{1}{216}$ C. $\frac{121}{132}$ D. $\frac{90}{12}$ E. None

27. What is the 12th term of the series $6 + 9 + 14 + 21 + \dots$?

- A. 101 B. 104 C. 95 D. 109 E. 149

28. If $f(x) = \frac{1}{3x}$, then $f(f(10)) = ?$

- A. 30 B. $\frac{1}{30}$ C. 10 D. 5 E. 0.1

29. $\log_4 64 = ?$

- A. 3 B. 5 C. 2 D. 0 E. None

30. A coin is tossed x times and there are total y outcomes. What is the equation of x and y?

- A. $y = 2$ B. $y = \frac{1}{2^x}$ C. $y = 2^x$ D. 1 E. None

31. The speed of Rakib is 8 km/h. He takes rest for 15 minutes at the end of every hour of walking on his way to destination. How many minutes will be required to go 32 km?

- A. 200 B. 250 C. 240 D. 360 E. 285

32. The ratio of two numbers is 6 : 1. Their sum is 21. Find the smallest number.

- A. 18 B. 21 C. 14 D. 12 E. None

33. If $x = \sqrt{3} + \sqrt{2}$, then $x + 1 = ?$

- A. $\sqrt{3}$ B. $\sqrt{2}$ C. $2\sqrt{3}$ D. $2\sqrt{2}$ E. $3\sqrt{3}$

34. $f(x) = \sqrt{(x^2 - c)}$ and $f(8) = 7$, then c = ?

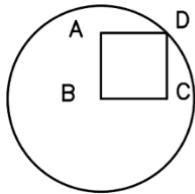
- A. 14 B. 10 C. 15 D. 20 E. None

35. The radius of a circle is 14 cm and its area is equal to the area of a square. What is the length of a side of the square?

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- A. 14 B. $\sqrt{14\pi}$ C. 14π D. $14\sqrt{\pi}$ E. None

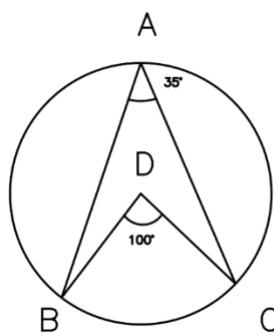
36.



If B is the center and radius of the circle is 5 cm, then the area of the square ABCD

- A. 12.5 B. 25 C. 40 D. 13 E. none

37. What is the value of $\angle C$ when D is the center of the circle?



- A. 30° B. 32° C. 32.5° D. 45° E. None

38. If $x^2 + y^2 = 13$ and $x + y = 5$ where $x < y$, then $y = ?$

- A. 4 B. 9 C. 2 D. 3 E. None

39. If $f(x) = x^2 + kx + 5$, and $f(2) = 0$, then $k = ?$

- A. $\frac{9}{2}$ B. 1 C. $-\frac{9}{2}$ D. 3 E. None

40. The perimeter of the square ABCD is 4 times its length, then $\frac{AB}{AC} = ?$

- A. $2 : 1$ B. $1 : 1$ C. $1 : \sqrt{2}$ D. 5 E. None

41. If $f(x) = x + 3$ and $y = 2x^2 + 12x + 18$, then the relation between y and $f(x)$ is:

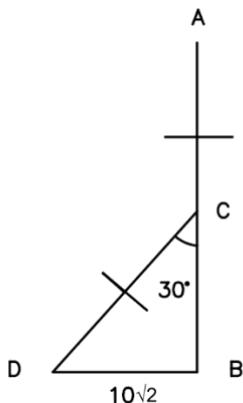
- A. $y = 2f(x)$ B. $y^2 = f(x)^2$ C. $f(x) = \sqrt{y}$ D. $y = 2[f(x)]^2$ E. None

42. A tree is 8 feet high. Its height increases at the rate of 9 inches per year. How long will it take for the tree to reach 11 feet in height?

- A. 5 years B. 3 years C. **4 years** D. 2 years E. None

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43.



Here $AC = CD$; $AB = ?$

- A. $10\sqrt{2}$ B. $10(2 + \sqrt{6})$ C. $10(\sqrt{6} + 2\sqrt{2})$
D. 40 E. None

44. Which of the following is not a value of x where $-\frac{1}{2} < x < \frac{1}{2}$?

- A. 0.5 B. 0.01 C. 0.10005 D. 0.1 E. None

45. Which term of the series 5, 8, 11, 14, ... is 317?

- A. 101 B. 104 C. 95 D. 103 E. None

46. $a_n = (a_{n-1} - 1)^2$ and $a_4 = 36$, then $a_3 = ?$

- A. $\sqrt{6}$ B. $\sqrt{6} + 1$ C. $\sqrt{6} - 1$ D. $3\sqrt{2}$ E. None

47. A certain species of bacteria doubles itself every hour after birth. If there are 10 bacteria in a container, then what will be the number of bacteria after 5 hours?

- A. 160 B. 80 C. 640 D. 320 E. None

48. The sum of 4 consecutive numbers is 218. Which of the following is a prime among them?

- A. 51 B. 60 C. 55 D. 34 E. 101

49. Which of the following is a multiple of $2x\sqrt{2}$?

- A. $3x\sqrt{2}$ B. $3x\sqrt{8}$ C. 2 D. $2x$ E. None

50. 1, 6, 16, 36, x. Here x = ?

- A. 46 B. 56 C. 76 D. 74 E. 55

Spring-24-Solution

Section 2 : Quantitative Aptitude

1. (A) $(x^p/x^q)^{p+q} \times (x^q/x^r)^{q-r} \times (x_r/x^p)^{r+p} = x^{p^2 - q^2 + q^2 - r^2 + r^2 - p^2} = x^0 = 1$

2. (A) Here, $a = 2^0$ and $r = 2^{0.5}$; 9th term $= 2^0 \cdot (2^{1/2})^{9-1} = 2^4 = 16$

3. (C) $25\% \times 50 = x \times 15\% \Rightarrow 25 / 100 \times 50 = x \times 15 / 100 \Rightarrow x = 250 / 3$

4. (E) Here, $r = 5\sqrt{2}$, $h = 10\sqrt{3}$. \therefore Volume $= \pi r^2 h = \pi \cdot 50 \cdot 10\sqrt{3} = 500\pi\sqrt{3}$

5. (B) In the first pick, green = 5 and total = $5 + 3 + 4 = 12$; Probability of green $= \frac{5}{12}$

In the second pick, green = $5 - 1 = 4$ and total = $4 + 3 + 4 = 11$.

Probability of green $= 4 / 11$; Total probability $= 5 / 12 \times 4 / 11 = 20 / 132$

6. (B) $BO = DO = 5$. $EB = \sqrt{5^2 - 3^2} = 4$. $AB = 2EB = 8$.

7. (A) $AD = 30$; So, $AE = 15$; $EF = 15$ [As EABF is square]

Area of the shaded region $= \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 15 \times 15 = 112.5$

8. (B) Here, $a = 3^0$ and $r = 3^{1/2}$; 11th term $= 3^0 \cdot (3^{1/2})^{\{11-1\}} = 3^5 = 243$

9. (C) Let, $AE = x$ & $AC = 3 + x$

We know, $\frac{AC}{AE} = \frac{BC}{DE}$ so, $3 + x/x = \frac{6.5}{5.5} \Rightarrow 16.5 + 5.5x = 6.5x \Rightarrow x = 16.5$

10. (D) In right triangle ABC, $\sin \angle ACB = \frac{AB}{AC} \Rightarrow AC = AB / \sin \angle ACB = 4\sqrt{3}$

11. (D) $5x + 5a = \frac{5y}{2} \Rightarrow 10x + 10a = 5y \Rightarrow a = \frac{1}{2}y - x$

12. (D) $A \cup (B \cap C) = \{2, 4, 5, 6, 9\} \cup \{4, 7, 11\} = \{2, 4, 5, 6, 7, 9, 11\}$

13. (C) $y > 2x + 5 \Rightarrow 2x - y < -5$

By putting the origin (0, 0), we get $0 < -5$ which is false. Therefore, the graph of the inequality is on the opposite side of the origin with respect to the $2x - y = -5$ line. Only option c has the similar graph

14. (A) Slope of the line $t = \frac{4+3}{12+2} = \frac{7}{14} = \frac{1}{2}$. Slope of the line $l = \frac{8+4}{-3-x} = \frac{12}{-3-x}$

According to the question, $(\frac{1}{2}) \times [12/-3 - x] = -1$; By evaluating, $x = 3$.

15. (E) Try option testing. The values from only option (e) satisfies both the equations.

16. (A) $\log^2 16\sqrt{8} = \log^2 (2^4 \cdot 2^{3/2}) = 11/2 \cdot \log^2 2 = 11/2$

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17. (D) $f(f(x)) = \sqrt{\{2(f(-2))^2 - 1\}} = \sqrt{2} \cdot 7 - 1 = \sqrt{13}$

18. (B) Let the present age of A, B & C be $4x$, $5x$ and $6x$; sum = $4x + 5x + 6x = 15x$.

18 years ago, the ratio of A, B & C was $11 : 16 : 21$. Let's consider the age of A & B.

According to the question, $\frac{4x - 18}{5x - 18} = \frac{11}{16} \Rightarrow 64x - 288 = 55x - 198 \Rightarrow 64x - 55x = -198 + 288 \Rightarrow 9x = 90 \Rightarrow x = 10$; Sum of the present ages = $15 \cdot 10 = 150$ year

19. (C) $4(4^2)^x = 4 \cdot 4^{\{2x\}} = 4^{\{2x+1\}} = 2^{\{4x+2\}}$; $2^{\{4x+2\}} = 256 \Rightarrow 2^{\{4x+2\}} = 2^8 \Rightarrow 4x + 2 = 8 \Rightarrow x = \frac{3}{2}$

20. (D) y alone does = $35 - 20 = 15$ photocopies per minute

21. (C) $3^m \sqrt[3]{32} = 3^m \sqrt[3]{(2^5)} = 2^{\{5/3m\}}$; So, $2^{\{3m\}} = 2^m \Rightarrow 5 / (3m) = m \Rightarrow 5 / 3 = m^2 \Rightarrow m = \sqrt{5/3}$ or $m = -\sqrt{5/3}$

22. (D) 1 g of coffee can make y cups of coffee.

12 g of coffee can make $12y$ cups of coffee.

According to the question, $x = 12y \Rightarrow x - 12y = 0$

23. (A) Let the numbers be x and y where $x > y$.

Then according to the question, $\frac{x + y}{(x - y)} = 11 : 1$

And $xy = 120$. By evaluating both the equations, $x = 12$ and $y = 10$. Smallest number = 10.

24. (B) $4^m \sqrt[4]{81} = 4^m \sqrt[4]{3^4} = 3^{\{4/m\}}$; $3^m = 3^{\{1/m\}} \Rightarrow m = 1/m \Rightarrow m^2 = 1 \Rightarrow m = 1$ or $m = -1$

25. (E) Try option testing. Only option (e) satisfies both of the equations.

26. (B) In 3 rolls, total cases = $6^3 = 216$. Total number of cases where there can be triple six = 1 and which is {6, 6, 6}; Probability = $\frac{1}{216}$

27. (E) 1st term = 6 = $5 + 1$

2nd term = 9 = $5 + 2^2$

3rd term = 14 = $5 + 3^2$

4th term = 21 = $5 + 4^2$

By observing the pattern among every terms of the series, we can conclude, n^t term = $5 + n^2$. Therefore, 12^t term = $5 + 12^2 = 149$.

28. (C) $f(f(10)) = \frac{1}{[3 \times (f(10))]} = \frac{1}{[3 \times (\frac{1}{3} \times 10)]} = 10$

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29. (A) $\log_4 64 = \log_4 4^3 = 3$

30. (C) Every time a coin is tossed; the possible outcomes are doubled. Therefore, for x tosses, there will be 2^x outcomes. Therefore, $y = 2^x$.

31. (E) Walking time = $\frac{32 \text{ km}}{8 \text{ km/h}} = 4 \text{ hours} = 4 \times 60 = 240 \text{ minutes}$

Resting time = $3 \times 15 = 45$ minutes as he will not take rest after reaching the destination.

Total time = $240 + 45 = 285$ minutes

32. (B) Let the numbers be $6x$ and x .

According to the question, $6x + x = 21 \Rightarrow 7x = 21 \Rightarrow x = 3$ which is the smallest number.

33. (C) $\frac{1}{x} = \frac{1}{(\sqrt{3} + \sqrt{2})} = \frac{(\sqrt{3} - \sqrt{2})}{((\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2}))} = \frac{(\sqrt{3} - \sqrt{2})}{(3 - 2)} = \sqrt{3} - \sqrt{2}$.

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

34. (C) $f(c) = \sqrt{8^2 - c} = \sqrt{64 - c} = 7 \Rightarrow 64 - c = 49 \Rightarrow c = 15$

35. (D) Area of the square = area of the circle = $\pi r^2 = 196\pi$.

The length of a side of the square = $\sqrt{196\pi} = 14\sqrt{\pi}$

36. (A) The diagonal of the square = the radius of the circle

A side of the square $a = \frac{5}{\sqrt{2}}$ cm; The area of the square = $a^2 = 25 / 2 = 12.5$

37. (C) The ABDC is a quadrilateral where the reflex $\angle BDC = 360^\circ - 100^\circ = 260^\circ$.

If we join A, D; then $\angle DAC = \frac{1}{2}\angle BAC = 17.5^\circ$ and $\angle ADC = \frac{1}{2}$ reflex $\angle BDC = 130^\circ$.

In triangle ADC, $\angle ACD = 180^\circ - \angle ADC - \angle DAC = 32.5^\circ$.

38. (D) $x + y = 5 \Rightarrow x = 5 - y$

Then, $(5 - y)^2 + y^2 = 13 \Rightarrow 25 - 10y + y^2 + y^2 = 13$

$$\Rightarrow 2y^2 - 10y + 12 = 0 \Rightarrow 2y^2 - 6y - 4y + 12 = 0 \Rightarrow 2y(y - 3) - 4(y - 3) = 0$$

$$\Rightarrow (y - 3)(2y - 4) = 0$$

$$\text{So, } y - 3 = 0 \Rightarrow y = 3 \text{ or } 2y - 4 = 0 \Rightarrow y = 2$$

$$\therefore x = 5 - y = 2 \text{ or } x = 5 - y = 3$$

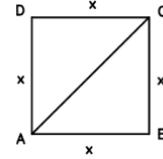
As $x < y$, so, $x = 2$ and $y = 3$.

39. (C) Here, $f(2) = 2^2 + 2k + 5 = 0 \Rightarrow 9 + 2k = 0 \Rightarrow k = -\frac{9}{2}$

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40. (C) Let the length AB = x, then perimeter = $4x$.

Whereas, perimeter = $2(AB + BC) = 4x \Rightarrow BC = x$. According to the theorem of Pythagoras, $AC^2 = AB^2 + BC^2 \Rightarrow AC = x\sqrt{2}$.



$$\text{So, } AB / AC = x / x\sqrt{2} = 1/\sqrt{2}$$

41. (D) $y = 2(x^2 + 6x + 9) = 2(x + 3)^2 = 2[f(x)]^2$

42. (C) Increase = $11 - 8 = 3$ feet = 36 inches

9 inches increase in 1 year; 36 inches increase in $36 / 9 = 4$ years

43. (C) In right triangle BCD, $\sin \angle BCD = BD / CD \Rightarrow CD = BD / \sin \angle BCD = BD / \sin 30^\circ = 20\sqrt{2}$

Again, $\cos \angle BCD = BC / CD \Rightarrow BC = CD \times \cos \angle BCD = 20\sqrt{2} \times \sqrt{3} / 2 = 10\sqrt{6}$

$$AB = AC + BC = 10\sqrt{6} + 20\sqrt{2} = 10(\sqrt{6} + 2\sqrt{2}) \quad [\text{AC} = CD]$$

44. (A) $0.5 = \frac{1}{2}$ which is not within the given range.

45. (E) First term $a = 5$, Common difference $d = 8 - 5 = 3$

$$\text{N}^{\text{th}} \text{ term} = a + (n - 1)d \Rightarrow 5 + (n - 1)3 = 317 \Rightarrow n - 1 = 104 \Rightarrow n = 105$$

46. (B) $a_4 = (a_3 - 1)^4 \Rightarrow 36 = (a_3 - 1)^4 \Rightarrow a_3 = \sqrt[4]{36} + 1 = \sqrt{6} + 1$

47. (D) The number of bacteria initially, $a = 10$

After n hours = $a \cdot r^n$, where $a = 10$ and $r = 2$. After 5 hours = $10 \cdot 2^5 = 320$.

48. (C) Average = $218 / 4 = 54.5$.

So, 54 and 55 are the middle numbers of the consecutive numbers.

So, the consecutive numbers = 53, 54, 55 and 56. Here, 53 is a prime number.

49. (B) From option b, $3x\sqrt{8} = 3 \cdot 2x\sqrt{2}$ which is a multiple of $2x\sqrt{2}$

50. (C) 1, 6, 16, 36, x, ...

Here, Difference between the first and the second term $(6 - 1) = 5$

Difference between the second and the third term $(16 - 6) = 10$

Difference between the third and the fourth term $(36 - 16) = 20$

So, the difference between the fourth and the fifth term will be $(x - 36) = 40$

Therefore, $x = 76$

Summer : 2024

Section 1: English Grammar and Vocabulary

1. My friends and I ____ to the beach tomorrow.
A. Goes B. Going **C. Are going** D. Was going
2. Convert the following sentence into Simple past tense: "She has gone to Chittagong and it's already been a week"
A. She went to Chittagong and it has been already a week.
B. She went to Chittagong and it was already a week.
C. She went to Chittagong and it was already a week.
D. She went to Chittagong and it was a week ago.
3. Which of the following spelling is accurate?
A. Mississippi B. Mississippi **C. Mississipi** D. Mississipi
4. If he ____ (study) harder, he will pass the exam.
A. Study **B. Studies** C. Studied D. Had studied
5. While I ____ (walk) to the store, I ____ (see) an old friend.
A. Walk, see B. Walks, saw **C. Was walking, saw** D. Walked, seen
6. "She is studying for her exams." Change this into Future Perfect Continuous tense.
A. She had been studying for her exams.
B. She has been studying for her exams.
C. She will have been studying for her exams.
D. She will have studied for her exams.
7. When two opinions ____ they agree.
A. Diverge B. Analyze C. Concur **D. Contest**
8. The number of students who ____ (attend) the conference last week was higher than expected.
A. Attended B. Attends C. Attend D. Attending
9. Either the teacher or the students ____ to complete the assignment by tomorrow.
A. Needs B. Needed **C. Need** D. Is needed

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10. Each of the students ____ responsible for completing their own assignments on time.

- A. Is B. Are C. Have D. Were

11. The word "Endure" is a/an ____.

- A. Noun B. Verb C. Adverb D. Adjective

12. "I had been studying for two hours before you called." Identify the tense.

- A. Present perfect tense B. Present perfect continuous tense
C. Past continuous tense D. **Past perfect continuous tense**

13. "The car was repaired by the mechanic." Convert this into active voice.

- A. The mechanic repair the car. B. **The mechanic repaired the car.**
C. The mechanic is repairing the car. D. The mechanic repaired the car.

14. ____ honesty is the best policy ?

- A. A B. An C. The D. **No article**

15. The library has a ____ of books on various subjects, making it a great place for research.

- A. Vast B. Many C. Uncountable D. **Plethora**

16. We should leave early, ____?

- A. Shouldn't they B. Shant't we C. **Shouldn't we** D. Shalln't we

17. The car moved extremely ____ in the heavy traffic.

- A. Slowness B. Slow C. **Slowly** D. More slow

18. We are interested ____ learning new languages.

- A. On B. Of C. In D. At

19. He didn't study for the test ____ he passed with flying colours.

- A. And B. **But** C. Because D. Or

20. She loves to travel ____ she doesn't have much time off work.

- A. Yet B. So C. **Although** D. Also

21. Make ____ better for the examination.

- A. **Yourselves** B. Yourselves C. Yours D. You

22. Einstein is ____ for his contributions to theoretical physics.

- A. Knowing B. Know C. Known D. Knows

23. Please take care while ____ the hike.

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- A. For B. On C. Of D. In
24. Understanding the _____ time management is crucial for success in any career.
- A. Necessity B. Necessary C. Necessitate of D. Necessity to
25. The bird perched _____ the fence.
- A. At B. On C. Of D. Before
26. With excitement, she found a dress _____ a boutique nearby.
- A. At B. On C. In D. From
27. She decided to buy _____ dress from _____ store she had visited last week.
- A. An, a B. An, an C. The, an D. A, the
28. She is not only intelligent but also _____.
- A. Succeeded B. Kindness C. Talent D. Beautiful
29. Neither cats nor dogs (allow) _____ in the restaurant.
- A. Allowed B. Is allowed C. Are allowed D. Allows
30. She said, "I _____ (hope) that you would come last night."
- A. Hoping B. Hoped C. Has hoped D. Hopes
31. He walked _____ the street.
- A. Across B. By C. Through D. At
32. Which of the following spelling is correct?
- A. Ambitous B. Ambititious C. Ambitious D. Ambetious
33. Which tense is used in the following sentence? "She has been studying for her exams all day."
- A. Present continuous B. Present perfect continuous
C. Past continuous D. Past perfect continuous
34. The shoes _____ me and that dress _____ her.
- A. Belong to, belong to B. Belongs to, belongs to
C. Belong to, belongs to D. Belong to, belong to
35. The word "Education" is a/an _____.
- A. Noun B. Verb C. Adjective D. Adverb
36. The company achieved their success _____ hard work.
- A. On B. In C. By D. For

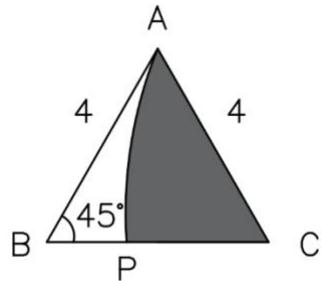
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37. These are the shoes ____ are too tight.
A. This B. Those C. That D. These
38. ____ the path through the forest, where ____ trees stood, was a serene experience.
A. Walking, towering B. Walked, tower
C. Walks, towers D. Walker, towered
39. If she (miss) ____ something, she would lose the job.
A. Misses B. Missed C. Miss D. Missing
40. The idiom "A piece of cake" means-
A. Something that is difficult and challenging.
B. Something that requires a lot of effort and skill.
C. Something that is impossible to achieve.
D. Something that is very easy to complete.

Section 2: Quantitative Aptitude

1. The sum of three consecutive odd numbers is 153. What is the smallest of them?

- A. 49 B. 51 C. 53 D. 50 E. none



2.

ABC is an isosceles triangle where C is the center of a circle. What is the perimeter of the shaded region?

- A. $8 + \pi$ B. $8 + 2\pi$ C. $4 + \pi$ D. 8π E. none

3. If $\sin\theta = \frac{2}{\sqrt{5}}$, then $\tan\theta = ?$

- A. 2 B. 1 C. 4 D. 4 E. none

4. The length of a rectangle is 7m more than the width. If its diagonal is 17m, then what is the length?

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- A. 7 B. 8 C. -15 D. 15 E. none

5. From 1 to 30, how many prime numbers are there?

- A. 10 B. 9 C. 11 D. 12 E. 8

6. If you randomly pick a natural number from 1 to 60, then what is the probability of the number being a prime of two digits?

- A. $\frac{17}{60}$ B. $\frac{18}{60}$ C. $\frac{15}{60}$ D. $\frac{13}{60}$ E. none

7. What is the area of the triangle formed by the coordinates (0, 1), (6, 4) and (1, 5)?

- A. 7.5 B. 10.5 C. 21 D. 14 E. none

8. Which of the following is a multiple of 45, 60, and 75?

- A. 750 B. 300 C. 450 D. 900 E. none

9. What is the LCM of 276 and 872?

- A. 23876 B. 80030 C. 60168 D. 5882 E. 90924

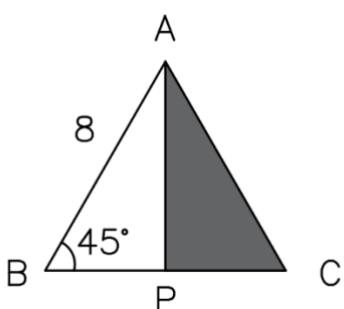
10. What is the mean of the following numbers: 96, 96.5, 97, 97.5, 98, 98, 98.5, 99, 99.5, 100?

- A. 98 B. 98.5 C. 97 D. 98.25 E. none

11. If $A = \{x: x \text{ is a multiple of } 3\}$ and $B = \{x: x \text{ is a factor of } 25\}$, then $A \cap B = ?$

- A. {1, 5, 25} B. {15} C. \emptyset D. {0} E. none

12.



ABC is an isosceles triangle. What is the area of the shaded region?

- A. 16 B. $4\sqrt{2}$ C. 8 D. 15 E. none

13. If $p + \frac{1}{p} = 2$, then $p^4 + \frac{1}{p^4} = ?$

- A. 2 B. 4 C. 10 D. 16 E. none

14. How many elements are there in the power set of {x, y, z}?

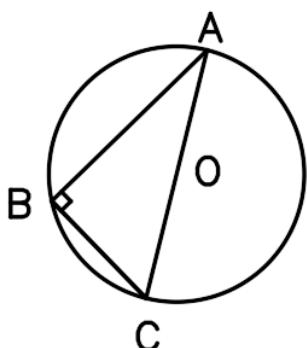
- A. 8 B. 4 C. 9 D. 7 E. none

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15. If $a + b = \sqrt{34}$, $a - b = \sqrt{25}$, what is the value of $8ab(a^2 + b^2)$?
A. 25 B. 531 C. 265.5 D. 334 E. none

16. What is the 50th term of the series: $4^1 + 4^2 + 4^3 + \dots$?
A. 4^{47} B. 4^{49} C. 4^{50} D. 0 E. none

17.



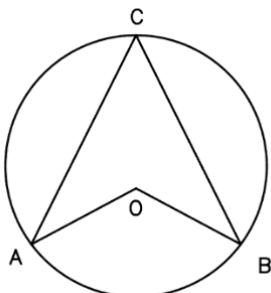
If $AB = 20$, $BC = 21$, then what is the area of the circle?

- A. $\frac{29}{2}\pi$ B. $\frac{841}{4}\pi$ C. 45π D. 2π E. none

18. $\cos 1^\circ \times \cos 2^\circ \times \cos 3^\circ \times \dots \times \cos 90^\circ = ?$
A. $\frac{1}{\sqrt{2}}$ B. 0 C. $9\cos 45^\circ$ D. 1 E. none

19. $g(x) = 8x^2 + 4$ and $g(1) = 16$, then $g(-1) = ?$
A. 44 B. 16 C. 12 D. 20 E. 4

20.



If $\angle AOB = x$, then $\angle ACB = ?$
A. x B. $2x$ C. $\frac{x}{2}$ D. $x - 45^\circ$ E. none

21. If $x^2 + y^2 = 100$ and $x + y = 14$ where $x < y$, then $y = ?$
A. 10 B. 3 C. 4 D. 8 E. None

NSU admission Past year Questions

22. What is the area of the quadrilateral formed by the points $(0, 0)$, $(6, 1)$, $(10, 5)$, $(2, 4)$?

- A. 35 B. 70 C. 15 D. 105 E. none

23. The ratio of two numbers is $1 : 2$ and if their difference is 12, then what's their sum?

- A. 12 B. 24 C. 36 D. 100 E. 48

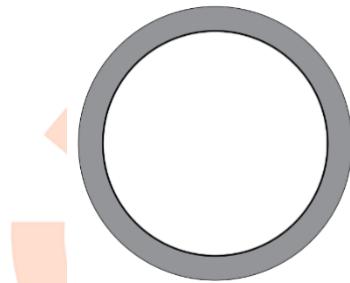
24. A side of a square is $7\sqrt{\pi}$ cm and its area is equal to the area of a circle. What's the perimeter of the circle?

- A. 14π B. $\frac{14}{\pi}$ C. 149 D. 30 E. none

25. If $e^{\sin(x)} = e^{\cos(x)}$, then $x = ?$

- A. 30° B. 60° C. 45° D. 75° E. 90°

26.



The diameters of the circles are 100 and 90 meters. What is the area of the shaded portion?

- A. 1900 m^2 B. $475\pi \text{ m}^2$ C. 400 D. None E. none

27. $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$, $A = \{1, 2, 3, 4, 5\}$ and $B = \{3, 4, 5, 6, 7\}$, then $A \cap B = ?$

- A. $\{0, 1, 2\}$ B. $\{1, 2\}$ C. $\{0\}$ D. $\{7, 8, 0\}$ E. none

28. If $f(x) = ax^2 - 7x + 4$ and $f(2) = 10$, then $a = ?$

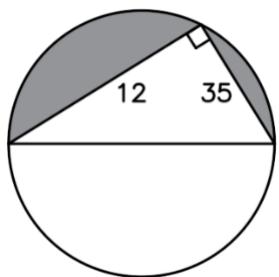
- A. 10 B. 5 C. $\frac{1}{2}$ D. 4 E. 2

29. There are 4 red balls, 6 green balls and 2 yellow balls in a bag. If two balls are picked randomly, what is the probability of both being yellow?

- A. $\frac{6}{11}$ B. $\frac{1}{6}$ C. $\frac{1}{12} + \frac{1}{11}$ D. $\frac{1}{66}$ E. none

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30.



What is the area of the shaded region?

- A. 537.6 B. 372.6 C. 300 D. $210\pi - 200$ E. $\frac{1369\pi}{8} - 210$

31. How many ways can all the vowels be arranged?

- A. 60 B. **120** C. 30 D. 150 E. none

32. If $|2x + 1| = |x - 3|$, then $x = ?$

- A. -4 B. 4 C. 5 D. $\frac{2}{3}$ E. both a & d

33. What should be the value of k so that the roots of the equation $x^2 + (k - 2)x + 4 = 0$ are real?

- A. $k \geq 6$ B. $k \geq -2$ C. $k < 2$ D. $k = 2$ E. $-2 < k < 6$

34. If $x + 2 = y$, then $x^3 + 3 = ?$

- A. $y^3 - 3y$ B. $y(y - 3)$ C. $y^3 + 3y$ D. both a & b E. none

35. If the points A(4, 2k), B(6k, 6), and C(-4, k) are on the same line, then what is the value of k?

- A. 4 B. 2 C. -2 D. 6 E. 0

36. If $\log_a 2x + \log_a 3x = \log_a 600$, then what is the value of x?

- A. 200 B. 50 C. **10** D. 0 E. 1

37. 15 members of a club play cricket, 14 members play football, 5 members play both and 4 members play none of these two sports. How many members are there in the club?

- A. 30 B. **28** C. 15 D. 26 E. none

38. What kind of triangle has the sides $2\sqrt{6}$, $3\sqrt{10}$, and $5\sqrt{3}$?

- A. obtuse B. right-angle C. acute
D. doesn't form a triangle E. none

39. What is a root of the equation $12x^2 - 7x - 10 = 0$?

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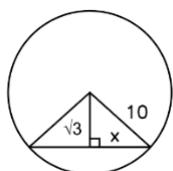
- A. $\frac{5}{4}$ B. $\frac{2}{3}$ C. 2 D. both a & b E. none

40. If α and β are the roots of $x^2 - 2x + 5 = 0$, then $(\alpha\beta + i^2) = ?$

- A. 5 B. -3 C. 6 D. 4 E. none

41. $\log_{10} 0.00001 = ?$

- A. -4 B. -6 C. -5 D. 0 E. 10



42.

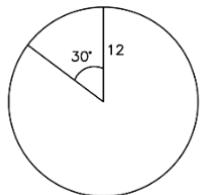
If $x = ?$

- A. $\sqrt{91}$ B. $\sqrt{97}$ C. 92 D. 90 E. none

43. The radius of a sphere increases by 0.1 cm in every 0.1 seconds. How much would its volume increase in 30 seconds if the starting radius is 1 cm?

- A. 36000 cm^3 B. 26000 mm^3 C. 1280 cm^3 D. $24000\pi \text{ cm}^3$ E. none

44.



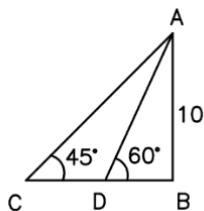
What is the area of the shaded region?

- A. 144π B. 12π C. 16π D. 148 E. none

45. A password of 4 letters contains 2 alphabets of A, B, C & D and 2 digits of 1, 2, 3 & 4. How many passwords are possible according to the condition?

- A. 96 B. 168 C. 864 D. 982 E. 1080

46.



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CD = ?

- A. 2 B. $2\sqrt{3} - 2$ C. $\sqrt{3}$ D. 5 E. 12

47. If the lines $3x + y = 10$ and $kx + 4y = 10$ are perpendicular, then $k = ?$

- A. $-\frac{4}{3}$ B. 3 C. 4 D. 5 E. none

48. If $f(x) = (2x)^2 - 3$ and $g(x) = 6 + 2x$, then $(fog)(7) = ?$

- A. 1 B. 33 C. 3 D. 5 E. -1

49. If $|x^2 - 5| = 4$, $x = ?$

- A. 1 B. 3 C. -1 D. -3 E. all

50. What is the n-th term of the following series: -15, -12, -9, ...?

- A. $3n - 15$ B. $4n - 18$ C. $5n - 5$ D. **3n - 18** E. none

Summer-24-Solution

Explanations :

1. (C) Since 'My friends and I' is a compound subject, 'are going' is used.
2. (B) Structure of simple past tense: Subject + V2 + Object.
3. (C) 'Mississippi' - a state in the U.S.
4. (B) This is an example of a first conditional. It follows the structure: If + simple present, will/can/must + infinitive.
5. (C) The sentence refers to an action happening in a period of time in the past. So 'was walking' and 'saw' is used.
6. (C) 'Subject + will have been + verb+ing' structure is followed.
7. (D) Concur means to be in agreement.
8. (A) Since the sentence is in its past form, 'Attended' is used.
9. (C) When "either...or" is used, the verb agrees with the subject that is closer to it. In this case, "students" is closer to the verb, and "students" is plural, so the correct form is "need."
10. (A) Each, each one, either, neither, everyone, everybody, anybody, anyone, nobody, somebody, someone, and no one are words that are singular in nature and, therefore, will always follow a singular verb.
11. (B) "Endure" - to suffer something painful in silence.
12. (D) subject+had+been+verb+ing+object.

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13. (B) The sentence is in past indefinite structure. The subject and object should be interchanged, and only the past form of the verb should remain.
14. (D) No article is needed before "honesty" because it is an uncountable noun used in a general sense.
15. (C) The statement is positive, so the tag question is negative.
16. (C) The statement is positive, so the tag question is negative.
17. (C) 'Slowly' is the corresponding adverb that describes how an action is performed here: "moved slowly"
18. (C) 'In' is used to indicate interest or involvement in a particular activity or subject.
19. (B) Here, 'But' is used as a conjunction since both clauses are contradicting.
20. (C) Here, 'Although' is used as a conjunction since both clauses are contradicting.
21. (A) "Yourselves" is the correct reflexive pronoun of the plural "you".
22. (C) 'Known' is used to describe someone who is recognized by people.
23. (B) 'On' is the appropriate preposition here since it indicates the period of hiking.
24. (A) 'Necessity' is a noun, and 'necessity of' implies it is necessary to do something.
25. (B) 'Perch on' means to sit or rest on something.
26. (A) 'At' is used to indicate a specific location.
27. (D) 'A' is used to indicate a single dress, and 'the' implies a specific store that was visited last week.
28. (D) The word 'Beautiful' is an adjective, and in the context of the question, an adjective should be used.
29. (C) In case of 'neither...nor', the verb agrees with the subject closest to it; here it is 'dogs'.
30. (B) The action refers to what has been done in the past. That's why 'hoped' is used.
31. (A) 'Walk across' means to walk from one side to the other.
32. (C) Ambitious.
33. (B) Here, 'subject + has been + verb+ing' structure has been used. Thus, it follows the present perfect continuous structure.
34. (B) Here, 'shoes' is plural, and thus 'belong to' is used; 'dress' is singular, and thus 'belongs to' is used.
35. (A) 'Education' – the process of receiving or giving systematic instruction.
36. (C) Here, 'by' is the appropriate preposition since it indicates how something is done.
37. (C) 'That' is used to indicate a specific thing mentioned previously, in this case - shoes.

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38. (C) ‘Walking’ implies a continuous action in the past; ‘towering’ is an adjective that means tall or high.

39. (B) This sentence follows the structure of a second conditional: if + simple past, would/could + infinitive.

40. (B) “A piece of cake” – something that is easy to do; an easy task.

Section 2 :

Explanations:

1. (A) The middle one of the numbers = $153/3 = 51$; the smallest one = $51 - 2 = 49$

2. (A) Perimeter = $AC + PC + \text{arc } AP = 4 + 4 + 2\pi \cdot 4 \cdot \frac{45^\circ}{360^\circ} = 8 + \pi$

3. (A) $\sin \theta = \frac{\text{perpendicular}}{\text{hypotenuse}} = \frac{2}{\sqrt{5}}$; then $\text{base}^2 = (\sqrt{5})^2 - 2^2 = 1 \Rightarrow \text{base} = 1$; $\tan \theta = \frac{\text{perpendicular}}{\text{base}} = \frac{2}{1} = 2$

4. (D) Let the width be x , then length = $x + 7$.

$$\text{Diagonal} = \sqrt{(x + 7)^2 + x^2} = \sqrt{2x^2 + 14x + 49}$$

$$\text{According to the question, } \sqrt{2x^2 + 14x + 49} = 17 \Rightarrow 2x^2 + 14x + 49 = 289$$

$$\Rightarrow 2x^2 + 14x - 240 = 0 \Rightarrow (x - 8)(x + 15) = 0 \Rightarrow x = 8 \text{ or } x = -15$$

Width = 8 m and length = $8 + 7 = 15$ m.

5. (A) There are total 10 prime numbers from 1–30: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29.

6. (D) All the prime numbers of two digits from 1 to 60 are: 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59. Total prime numbers of two digits = 13. Meanwhile total numbers = 60. Probability of the number being a prime of two digits = $13/60$.

$$7. (B) \text{Area} = \frac{1}{2} \begin{vmatrix} 0 & 1 & 1 \\ 6 & 4 & 1 \\ 1 & 5 & 1 \end{vmatrix} = \frac{1}{2} [0(4 - 5) - 1(6 - 1) + 1(30 - 4)] = 10.5$$

8. (D) The required number will be a multiple of LCM (45, 60, 75). $45 = 3^2 \times 5$, $60 = 2^2 \times 3 \times 5$ and $75 = 3 \times 5^2$; $\text{LCM}(45, 60, 75) = 2^2 \times 3^2 \times 5^2 = 900$

9. (C) $276 = 2^2 \times 3 \times 23$ and $872 = 2^3 \times 109$; $\text{LCM}(276, 872) = 2^3 \times 3 \times 23 \times 109 = 60168$

$$10. (A) \text{Mean} = \frac{96 + 96.5 + 97 + 97.5 + 98 + 98 + 98.5 + 99 + 99.5 + 100}{10} = 980/10 = 98$$

11. (C) $A = \{3, 6, 9, 12, 15, 18, 21, 24, 27, \dots\}$ and $B = \{1, 5, 25\}$

$$A \cap B = \{3, 6, 9, 12, 15, \dots\} \cap \{1, 5, 25\} = \emptyset$$

12. (A) $\angle ACP = \angle ABP = 45^\circ$ and $AC = AB = 8$; $PC = AC \cos \angle ACP = 4\sqrt{2}$;

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Area of APC = $\frac{1}{2} \times PC \times AP = \frac{1}{2} \times 4\sqrt{2} \cdot 4\sqrt{2} = 16$ [AP = $\sqrt{AC^2 - PC^2} = 4\sqrt{2}$]

$$13. (A) p + \frac{1}{p} = 2 \Rightarrow p^2 + \frac{1}{p^2} + 2 = 4 \Rightarrow p^2 + \frac{1}{p^2} = 2 \Rightarrow p^4 + \frac{1}{p^4} + 2 = 4 \Rightarrow p^4 + \frac{1}{p^4} = 2$$

14. (A) Number of elements of the given set n = 3

Number of elements of the power set of the given set = $2^n = 2^3 = 8$

$$15. (B) 8ab(a^2 + b^2) = 4ab \cdot 2(a^2 + b^2) = \{(a+b)^2 - (a-b)^2\} \cdot \{(a+b)^2 + (a-b)^2\} = (34+25)(34-25) = 531$$

16. (C) First term a = 4, common ratio d = 4. 50th term = $a r^{n-1} = 4 \cdot 4^{50-1} = 4^{50}$

17. (B) $\angle ABC = 90^\circ$, therefore angle in semicircle. So, AC is a diameter.

\therefore According to the Pythagorean theorem, $AC = \sqrt{AB^2 + AC^2} = 29$ unit. Radius r = 29/2

$$\therefore \text{Area} = \pi r^2 = \frac{841}{4} \pi$$

18. (B) $\cos 90^\circ = 0$, therefore, $\cos 1^\circ \cdot \cos 2^\circ \cdot \cos 3^\circ \dots \cdot 0 = 0$

$$19. (B) g(1) = 8a(1)^2 + 4 = 8a + 4 = 16; g(-1) = 8a(-1)^2 + 4 = 8a + 4 = 16$$

20. (C) $\angle AOB$ is the central angle and $\angle ACB$ is the inscribed angle, both standing on the same arc.

Therefore, $2\angle ACB = \angle AOB \Rightarrow \angle ACB = \frac{1}{2}x$

21. (D) $x + y = 14 \Rightarrow x = 14 - y$. Then, $(14 - y)^2 + y^2 = 100 \Rightarrow 196 - 28y + y^2 + y^2 = 100 \Rightarrow 2y^2 - 28y + 96 = 0 \Rightarrow y^2 - 14y + 48 = 0 \Rightarrow (y - 8)(y - 6) = 0$; $y = 6$ and $x = 8$ or $y = 8$ and $x = 6$. As $x < y$, So, $y = 8$

$$22. (A) \text{Area} = \frac{1}{2} \begin{vmatrix} 0 & 6 & 10 & 2 & 0 \\ 0 & 1 & 5 & 4 & 0 \end{vmatrix} = 35 \text{ sq unit}$$

23. (C) Let the numbers be x and 2x. Difference = $2x - x = x$

According to the question, $x = 12$. Sum = $x + 2x = 3x = 3 \times 12 = 36$

24. (A) Area of the square = $(7\sqrt{\pi})^2 = 49\pi \text{ cm}^2$. Let the radius be r. Then $\pi r^2 = 49\pi \Rightarrow r = 7 \text{ cm}$

Perimeter of the circle = $2\pi r = 14\pi \text{ cm}$

25. (C) $e^{\{\sin x\}} = e^{\{\cos x\}} \Rightarrow \sin x = \cos x \Rightarrow \tan x = 1$; By option testing, $x = 45^\circ$

26. (B) Radius = $100/2 \text{ m}$ and $90/2 \text{ m} = 50 \text{ m}$ and 45 m

Area of the shaded region = Area of the bigger circle – Area of the smaller circle

$$= (50^2 - 45^2) \pi = 475\pi \text{ m}^2$$

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27. (C) $A' = U - A = \{0, 1, 2, 3, 4, 5, 6, 7, 8\} - \{1, 2, 3, 4, 5\} = \{0, 6, 7, 8\}$

$B' = U - B = \{0, 1, 2, 3, 4, 5, 6, 7, 8\} - \{3, 4, 5, 6, 7, 8\} = \{0, 1, 2\}$

$A' \cap B' = \{0, 6, 7, 8\} \cap \{0, 1, 2\} = \{0\}$

28. (B) $f(2) = 10 \Rightarrow a(2)^2 - 7 \cdot 2 + 4 = 10 \Rightarrow 4a - 14 + 4 = 10 \Rightarrow a = 5$

29. (D) Before first pick, total balls = $4 + 6 + 2 = 12$

Yellow balls = 2. Probability of the first ball being yellow = $2/12 = \frac{1}{6}$

Before second pick, total balls = $12 - 1 = 11$

Yellow balls = $2 - 1 = 1$. Probability of the second ball being yellow = $\frac{1}{11}$

Probability of both balls being yellow = $\frac{1}{6} \times \frac{1}{11} = \frac{1}{66}$

30. (E) Diameter = $\sqrt{12^2 + 35^2} = 37$ Radius = $37/2$

Area of the half circle = $\frac{\pi r^2}{2} = \frac{1369\pi}{8}$

Area of the triangle = $\frac{1}{2} \cdot 12 \cdot 35 = 210$

Area of the shaded region = $\frac{1369\pi}{8} - 210$

31. (B) The number of vowels = 5. Ways to arrange 5 elements = $5! = 120$

32. (E) $|2x + 1| = |x - 3| \Rightarrow 2x + 1 = \pm (x - 3)$

Either $2x + 1 = x - 3$ or $2x + 1 = -x + 3$

$\Rightarrow x = -4$ or $3x = 2 \Rightarrow x = \frac{2}{3}$

33. (A) Here, $D = b^2 - 4ac = (k - 2)^2 - 4 \cdot 1 \cdot 4 = k^2 - 4k + 4 - 16 = k^2 - 4k - 12$

$= k^2 - 6k + 2k - 12 = (k - 6)(k + 2)$

For the roots to be real, $D \geq 0 \Rightarrow (k - 6)(k + 2) \geq 0 \Rightarrow (k \geq 6 \text{ and } k \geq -2) \text{ or } (k \leq 6 \text{ and } k \leq -2) \Rightarrow k \leq -2 \text{ or } k \geq 6$

34. (A) $x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3 \cdot x \cdot \frac{1}{x} \left(x + \frac{1}{x}\right) = y^3 - 3y$

35. (B) $mAC = \frac{k - 2k}{-4 - 4} = k/8$ and $mBC = (k - 6)/(-4 - 6k)$

According to the question, $mAC = mBC \Rightarrow k/8 = \frac{k - 6}{-4 - 6k} \Rightarrow -4k - 6k^2 = 8k - 48 \Rightarrow 6k^2 + 12k - 48 = 0 \Rightarrow k^2 + 2k - 8 = 0 \Rightarrow (k + 4)(k - 2) = 0 \Rightarrow k = -4 \text{ or } 2$

36. (C) $\log_a 2x + \log_a 3x = \log_a 600 \Rightarrow \log_a (6x^2) = \log_a 600 \Rightarrow 6x^2 = 600 \Rightarrow x = 10$

37. (B) Total = cricket + football - both + none = $15 + 14 - 5 + 4 = 28$

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38. (C) Here, $(2\sqrt{6})^2 = 24$, $(3\sqrt{10})^2 = 90$ and $(5\sqrt{3})^2 = 75$

Now, $24 + 90 = 114 > 75$, $24 + 75 = 99 > 90$ and $90 + 75 = 165 > 24$

\therefore It forms an acute triangle.

39. (A) $12x^2 - 7x - 10 = 0 \Rightarrow 12x^2 - 15x + 8x - 10 = 0 \Rightarrow 3x(4x - 5) + 2(4x - 5) = 0 \Rightarrow (4x - 5)(3x + 2) = 0 \Rightarrow x = \frac{5}{4}$ or $x = -\frac{2}{3}$

40. (D) $x^2 - 2x + 5 = 0$. Here, $\alpha\beta = 5$. So, $\alpha\beta + i^2 = 5 + (\sqrt{-1})^2 = 5 - 1 = 4$

41. (C) $\log_{10} 0.00001 = \log_{10} 10^{-5} = -5$

42. (B) According to the theorem of Pythagoras,

$$10^2 = (\sqrt{3})^2 + x^2 \Rightarrow x^2 = 100 - 3 = 97 \Rightarrow x = \sqrt{97}$$

43. (C) In 30 seconds, the radius increases = $0.1/0.1 \times 30 = 30$ cm.

Before increase, radius = 1, volume $V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi$

After increase, radius = $(r + 30)$, volume $V' = \frac{4}{3}\pi(r + 30)^3 = \frac{4}{3}\pi 31^3 = 961 \times \frac{4}{3}\pi$

Total increase in volume = $V' - V = 960 \times \frac{4}{3}\pi = 1280\pi$

44. (B) Area of the shaded region = $\frac{\pi r^2 \times 30^\circ}{360^\circ} = 12\pi$

45. (C) Ways to select 2 letters out of 4 letters = 4C_2 ; ways to select 2 digits out of 4 digits = 4C_2 ; ways to arrange 4 characters of the password = $4!$; total ways = ${}^4C_2 \cdot {}^4C_2 \cdot 4! = 864$

46. (B) In triangle ABD, $\tan \angle ADB = \frac{AB}{BD} = \tan 60^\circ = \frac{2\sqrt{3}}{BD} \Rightarrow BD = 2$

In triangle ACB, $\tan \angle ACB = \frac{AB}{BC} = \frac{2\sqrt{3}}{CD+2} \Rightarrow CD + 2 = \frac{2\sqrt{3}}{\tan 45^\circ} = 2\sqrt{3} \Rightarrow CD = 2\sqrt{3} - 2$

47. (A) $m_1 = -\frac{3}{1} = -3$ and $m_2 = -\frac{k}{4}$

As the lines are perpendicular, $m_1 m_2 = -1 \Rightarrow (-3) \cdot \left(-\frac{k}{4}\right) = -1 \Rightarrow \frac{3k}{4} = -1 \Rightarrow k = -\frac{4}{3}$

48. (B) $g(7) = \frac{6+2 \cdot 7}{2-7} = 20/-5 = -4$; $(fog)(7) = f(g(7)) = (2+4)^2 - 3 = 36 - 3 = 33$

49. (E) $|x^2 - 5| = 4 \Rightarrow x^2 - 5 = \pm 4 \Rightarrow x^2 = 1$ or $x^2 = 9 \Rightarrow x = \pm 1$ or $x = \pm 3$

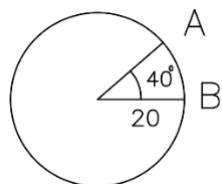
50. (D) Given, $a = -15$, $d = -12 - (-15) = 3$

n^{th} term = $a + (n - 1)d = -15 + (n - 1)(3) = 3n - 18$

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Section 2: Quantitative Aptitude

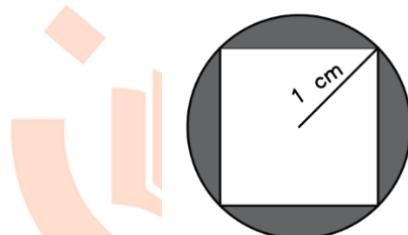
1.



What is the length of arc AB?

- A. 20π B. 40π C. $\frac{40}{9}\pi$ D. 35π E. none

2.



qualify

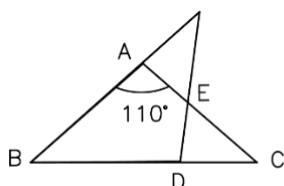
What is the area of the darker region?

- A. $\pi - 2$ B. π C. $2\pi - 1$ D. $1 - 2\pi$ E. none

3. The length and width of a rectangular field is at the ratio 3 : 4. If its perimeter is 14 m, then what is the diagonal of the field?

- A. 9 B. 25 C. 5 D. 1 E. none

4.

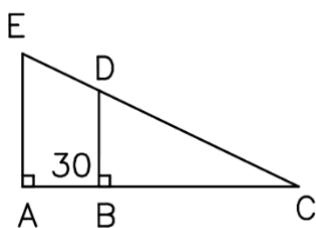


If AB = AC, then $\angle ECD = ?$

- A. 40° B. 50° C. 45° D. 35° E. none

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5.



If $\tan C = \frac{3}{4}$ and $CE = 100$, then $DE = ?$

- A. $\frac{75}{2}$ B. 40 C. 3.33 D. 45 E. 15

6. If $2\log x - \log 2 = \log 27$, then $x = ?$

- A. $\sqrt{6}$ B. $3\sqrt{6}$ C. 18 D. $6\sqrt{3}$ E. 15

7. The length, width and height of an aquarium is 20 cm, 10 cm & 5 cm. If 12 L water is poured into the aquarium, then what's the increase in height?

- A. 45 cm B. 40 cm C. 55 cm D. 50 cm E. none

8. $f(x) = ax^2 + b$ and $f(4) = 16$, then $f(-4) = ?$

- A. 12 B. 16 C. -16 D. 5 E. none

9. What is the lowest value of $f(x)$ when $f(x) = x^2 + 2x - 1$?

- A. 0 B. -10 C. 12 D. -2 E. none

10. If $f(x) = \frac{1}{x+1}$ and $g(x) = x^2 + 2x - 1$, then $f(g(x)) = ?$

- A. $\frac{1}{x^2+2x}$ B. $\frac{1}{x^2} + \frac{2}{x} - \frac{1}{x^2}$ C. $\frac{2}{x} - \frac{1}{x^2}$ D. $2x + 1$ E. none

11. What is the next number in the following series: 2, 4, 10, 24, 58?

- A. 158 B. 130 C. 108 D. 120 E. 140

12. What is the difference between two prime numbers that are larger than 23 but smaller than 37?

- A. 5 B. 8 C. 10 D. 2 E. none

13. X is a number of two digits. If the difference of the two digits is 6 and the difference of their square is 60, then what is the number?

- A. 80 B. 82 C. 81 D. 58 E. 41

14. Saiful's spends $\frac{3}{2}$ part of his yearly income on his family and saves the rest in 4 bank accounts. If each of the accounts save \$2000, then what's his yearly income?

- A. \$32000 B. \$48000 C. **\$24000** D. \$12000 E. \$10000

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15. One part of 1200 is invested at the rate of 5% interest and the other at 7% interest. If the total interest earned at the end of the year is 72 taka, then what's the amount invested at 5% interest?

- A. 750 B. 450 C. 500 D. **600** E. none

16. If the selling price is \$25, and profit is 25%, what's the profit amount?

- A. \$5 B. **\$6.25** C. \$7.25 D. \$4.50 E. none

17. $\sqrt{125} + \sqrt{45} + \sqrt{20} = ?$

- A. $18\sqrt{5}$ B. $5\sqrt{5}$ C. $15\sqrt{5}$ D. $12\sqrt{5}$ E. **$10\sqrt{5}$**

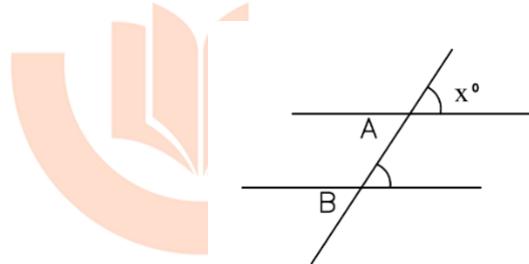
18. If $A : B = 2 : 3$ and $2B : C = 8 : 5$, then $A : C = ?$

- A. $2 : 5$ B. **8 : 15** C. $12 : 5$ D. $3 : 7$ E. none

19. If $\frac{a^{x^2}}{a^{y^2}} = a^{16}$ and $x - y = 2$, then $x + y = ?$

- A. 8 B. 32 C. 12 D. 10 E. 4

20.



alify

$A + B = ?$

- A. x° B. $\frac{1}{2}x^\circ$ C. $2x^\circ$ D. x° E. none

21. If $x + y - 13 = 0$ and $x - 2y + 9 = 0$, then $(x, y) = ?$

- A. $(\frac{17}{3}, \frac{22}{3})$ B. $(-9, \frac{3}{17})$ C. $(-9, -\frac{17}{3})$ D. $(-9, \frac{17}{3})$ E. none

22. If a circle's radius is 3 times another circle, then what is the ratio of their area?

- A. $1 : 3$ B. $1 : 3\pi$ C. **1 : 9** D. $3 : 9$ E. none

23. Muntasir goes D distance in $(t - 6)$ s. What's the distance he goes in $(t^2 - 36)$ s?

- A. **D(t + 6)** B. $\frac{D}{t+6}$ C. $D(t - 6)$ D. $\frac{D}{t-6}$ E. none

24. The radius of a wheel is 18 cm. How long will it go in 20 spins?

- A. 360π B. **720\pi** C. 180π D. 900π E. none

25. A rectangle & a square has the same area. If the length & width of the rectangle are 9 m and 4 m respectively, then what is the perimeter of the square?

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- A. 36 B. 12 C. **24** D. 18 E. 72

26. Which of the following is equal to $\sin(\pi/3)$?

- A. $\tan\left(\frac{\pi}{4}\right)$ B. $\cos\left(\frac{\pi}{3}\right)$ C. **$\cos\left(\frac{\pi}{6}\right)$** D. $\cos\pi$ E. $\sec\left(\frac{\pi}{2}\right)$

27. If $0 \leq \theta \leq 90^\circ$, then $-\frac{\cos\theta}{\sin\theta} \times \tan\theta = ?$ \

- A. 1 B. 0 C. ∞ D. **-1** E. none

28. If radius increases 6 cm, what will be the increase in the perimeter of the circle?

- A. **12 π** B. 6π C. 3π D. π E. none

29. A bill has been passed at the vote ratio of 5 : 4. If 100 votes were cast on the side of passing the bill, then how many votes were cast against it?

- A. 120 B. 100 C. 90 D. 160 E. **80**

30. If two sides of a triangle are equal to each other, then what's the category of the triangle?

- A. equilateral B. **isosceles** C. right-angle
D. scalene E. none

31. What is the next term in the following series: 3 - 6 + 9 - ...?

- A. 12 B. 15 C. 10 D. 11 E. **-12**

32. Which of the following lengths cannot form a triangle?

- A. 4, 5, 6 B. 10, 12, 1 C. **10, 11, 1** D. 3, 4, 5 E. 12, 13, 5

33. The sum of 4 consecutive even numbers is 172. What's the largest of them?

- A. 42 B. 43 C. 44 D. 40 E. **46**

34. What's the sum of the first 10 prime numbers?

- A. 60 B. **110** C. 55 D. 120 E. 130

35. How many elements are there in the subset of $\{a, 0, 1, \emptyset\}$?

- A. 15 B. 17 C. 9 D. **16** E. none

36. Saima purchased an offer on which she received 50% more products. If she was to get 200% more products at the same price, then what should be the percentage of discount?

- A. 150% B. **50%** C. 150% D. 300% E. none

37. Which of the following is not an irrational number?

- A. π B. e C. $\sqrt{7}$ D. $\sqrt{-1}$ E. none

38. What is the maximum value of $\cos x$?

- A. -1 B. 0 C. **1** D. $\frac{1}{\sqrt{2}}$ E. none

39. After an increase of 25%, Arif's salary became 100,000 taka. What was his previous salary?

- A. 75,000 B. 8,000 C. **80,000** D. 120,000 E. none

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40. If $|x+3|=10$, then $x=?$

- A. 7 B. 13 C. -13

D. both A & B E. both A & C

41. If $A = \{2, 3, 6\}$, $B = \{1, 4, 7, 9, 11\}$ and $C = \{5, 6, 7, 9, 10\}$, then $A \cup (B \cap C) = ?$

- A. $\{1, 2, 3, 6, 7\}$ B. $\{2, 3, 9\}$ C. $\{2, 3, 6, 7, 9\}$
D. \emptyset E. none

42. If $2 \leq x \leq 6$ and $-2 \leq y \leq 4$, then what is the highest value of $x - y$?

- A. 8 B. 6 C. 10 D. 12 E. 7

43. If $7 - 5x \leq -4x - 4$, then which of the following is true for x ?

- A. $x > 11$ B. $x \geq 11$ C. $x < -11$ D. $x > 10$ E. none

44. If 20 students took mathematics, 10 students took biology and 7 students took both, then how many students took either mathematics or biology?

- A. 30 B. 27 C. 17 D. 25 E. 23

45. If the average of x & y is 20 and a & b is 30, then what is the average of all four?

- A. 50 B. 25 C. 35 D. 10 E. none

46. How many ways Mr. Shaful, Mr. Kaiser and Mr. Sulaiman can sit in 5 chairs?

- A. 120 B. 180 C. 45 D. 60 E. none

47. A dice has been thrown 2 times. What is the probability of the sum of both results being greater than 10?

- A. $\frac{1}{9}$ B. $\frac{1}{12}$ C. $\frac{3}{15}$ D. $\frac{1}{36}$ E. none

48. If $\sqrt{x} - 1 = 10$, then $x = ?$

- A. 100 B. 81 C. 144 D. 121 E. none

49. If $x^2 = -4$, then $x = ?$

- A. $-4i$ B. $4i$ C. $-2i$ D. $2i$ E. none

50. Which of the following graph is a horizontal line?

- A. $-x = 1$ B. $y = 1$ C. $x + y = 1$ D. $x - y = 0$ E. none

Section 2: Quantitative Aptitude

1. (C) Length of arc AB = $2\pi \times 20 \times 40^\circ / 360^\circ = \left(\frac{40}{9}\right)\pi$.
2. (A) ATQ, for the square, r = 1, so a = $\sqrt{2}$; Area for Square = $(\sqrt{2})^2 = 2$. So, the area of the darker region = circle – square = $\pi - 2$.
3. (C) Let length = 4x and width = 3x. Then the perimeter = $14x \Rightarrow 14x = 14 \Rightarrow x = 1$. Hence, length = 4 m and width = 3 m. Then, the diagonal = $\sqrt{(3^2 + 4^2)} = 5$ m.
4. (D) AB = AC, then $\angle ABC = \angle ACB = \frac{180^\circ - 110^\circ}{2} = 35^\circ$.
5. (A) Let AC = 4x and AE = 3x. Then CE = $\sqrt{(16x^2 + 9x^2)} = 5x$. Therefore, $5x = 100 \Rightarrow x = 20$. So, AC = 4x = 80. As ΔACE and ΔABC are similar triangles, $\frac{CE}{DE} = \frac{AC}{AB} \Rightarrow DE = CE \times \frac{AB}{AC} = 100 \times 30 / 80 = \frac{75}{2}$.
6. (B) $2\log x - \log 2 = \log 27 \Rightarrow \log\left(\frac{x^2}{2}\right) = \log 27 \Rightarrow x^2 = 54 \Rightarrow x = 3\sqrt{6}$.
7. (C) New height = $12000 \div (20 \times 10) = 60$. Increase = $60 - 5 = 55$ cm.
8. (B) Here, $f(-x) = a(-x)^2 + b = ax^2 + b = f(x)$; so, $f(-4) = f(4) = 16$.
9. (D) $f(x) = x^2 + 2x - 1 = (x^2 + 2x + 1) - 2 = (x + 1)^2 - 2$. There exists a lowest value of $f(x)$ when $x + 1 = 0 \Rightarrow x = -1$. Thus, $f(-1) = 0 - 2 = -2$.
10. (A) $f(g(x)) = \frac{1}{g(x)+1} = \frac{1}{x^2+2x}$.
11. (E) According to the question, we can find out that, the n^{th} term = $2 \times [(n - 1)^{\text{th}} \text{ term}] + [(n - 2)^{\text{th}} \text{ term}]$. So, next term = $2 \times 58 + 24 = 140$.
12. (D) Difference = $31 - 29 = 2$.
13. (B) Option test. From (b): $8 - 2 = 6$ and $8^2 - 2^2 = 60$.
14. (C) $1 - 2/3$ of income = $8000 \Rightarrow 1/3$ of income = 8000 . Total income = $\$8000 \times 3 = \24000 .
15. (D) Let the amount invested at 5% interest be x. Then according to the question $72 = x \times 5\% + (1200 - x) \times 7\% \Rightarrow 0.05x + 84 - 0.07x = 0.02x = 12 \Rightarrow x = 600$.
16. (B) Profit = $\$25 \times 25\% = \6.25 .
17. (E) $\sqrt{125} + \sqrt{45} + \sqrt{20} = 5\sqrt{5} + 3\sqrt{5} + 2\sqrt{5} = 10\sqrt{5}$.
18. (B) A : B \times 4 = 8 : 12 and B : C \times 3 = 12 : 15; so, A : B : C = 8 : 12 : 15.

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19. (A) $\frac{a^{x^2}}{a^{y^2}} = a^{16} \Rightarrow a^{x^2 - y^2} = a^{16} \Rightarrow x^2 - y^2 = 16$

$\Rightarrow (x + y)(x - y) = 16$. Since $x - y = 2$, $x + y = 16/2 \Rightarrow x + y = 8$.

20. (C) $A = x^\circ$ [vertically opposite angle] and $A = B$ [corresponding angle].

So, $A + B = 2x^\circ$.

21. (A) By option checking, $x = \frac{17}{3}$ and $y = \frac{22}{3}$ satisfies both equations.

22. (C) Let the smaller circle's radius = r , then the other's radius = $3r$. Ratio of area = $\pi r^2 : \pi(3r)^2 = \pi r^2 : 9\pi r^2 = 1 : 9$.

23. (A) In 1 second, he goes $= \frac{D}{t-6}$. In $(t^2 - 36)$ second, he goes $= \frac{D(t^2 - 36)}{t-6} = D(t + 6)$.

24. (B) Distance covered in 20 spins = $20 \times \text{perimeter} = 20 \times 2\pi \times 18 = 720\pi$.

25. (C) Area of the square = area of the rectangle = $9 \times 4 = 36 \text{ m}^2$. Side of the square = $\sqrt{36} = 6 \text{ m}$. Perimeter = $4 \times 6 = 24 \text{ m}$.

26. (C) $\sin \frac{\pi}{3} = \cos \left(\frac{\pi}{2} - \frac{\pi}{3}\right) = \cos \left(\frac{\pi}{6}\right)$.

27. (D) $-\left(\frac{\cos\theta}{\sin\theta}\right) \times \tan\theta = -\left(\frac{\cos\theta}{\sin\theta}\right) \times \left(\frac{\sin\theta}{\cos\theta}\right) = -1$.

28. (A) Let radius = r , perimeter = $2\pi r$. After increase, radius = $r + 6$, perimeter = $2\pi(r + 6) = 2\pi r + 12\pi$. Increase in perimeter = $2\pi r + 12\pi - 2\pi r = 12\pi$.

29. (E) Against = $100/5 \times 4 = 80$.

30. (B) An isosceles triangle is defined as a triangle with two sides of equal length.

31. (E) n^{th} term of the following series = $(-1)^n (3n)$. Next term = -12 .

32. (C) $10 + 1 = 11 > 11$. So, these lengths can't form a triangle.

33. (E) Let the first number be n . Then, $n + (n + 2) + (n + 4) + (n + 6) = 4n + 12 \Rightarrow 4n + 12 = 172 \Rightarrow n = 40$. So, largest = $n + 6 = 46$.

34. (B) Sum = $2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23 + 29 = 110$.

35. (D) Here, $n = 4$. So, number of elements in the subset = $2^4 = 16$.

36. (B) Original Price per Unit = $\frac{P}{150}$ units. New Price per Unit = $\frac{P}{300}$ units. Discount

Percentage = $\left[\frac{\frac{P}{150} - \frac{P}{300}}{\frac{P}{150}} \right] \times 100 = \left(\frac{P}{300} \times \frac{150}{P} \right) \times 100 = 50\%$.

37. (D) Irrational numbers are real numbers.

38. (C) The maximum value of $\cos(x)$ is 1.

39. (C) Let previous salary be x . Then, $(100 + 25)\% \text{ of } x = 100000 \Rightarrow x = 80,000$.

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40. (E) $|x + 3| = 10 \Rightarrow x + 3 = \pm 10 \Rightarrow x = -13$ or $x = 7$.
41. (C) $B \cap C = \{1, 4, 7, 9, 11\} \cap \{5, 6, 7, 9, 10\} = \{7, 9\}$. $A \cup (B \cap C) = \{2, 3, 6\} \cup \{7, 9\} = \{2, 3, 6, 7, 9\}$.
42. (A) Highest value of $(x - y)$ = highest x – lowest y = $6 - (-2) = 8$.
43. (B) $7 - 5x \leq -4x - 4 \Rightarrow x \geq 11$.
44. (E) Here, $n(M) = 20$, $n(B) = 10$, $n(M \cap B) = 7$, then $n(M \cup B) = 20 + 10 - 7 = 23$.
45. (B) Average of all four = $\frac{20 \times 2 + 30 \times 2}{4} = \frac{40 + 60}{4} = 25$.
46. (D) Ways to arrange 3 objects out of 5 objects = $5P3 = \frac{5!}{(5-3)!} = 60$.
47. (B) Total case = $6^2 = 36$. Required case = $\{(5,6), (6,5), (6,6)\}$. Probability = $\frac{3}{36} = \frac{1}{12}$.
48. (D) $\sqrt{x} - 1 = 10 \Rightarrow x = 11^2 = 121$.
49. (D) $x^2 = -4 = 4(-1) \Rightarrow x = 2i$.
50. (B) The graph of a horizontal line is represented by the equation $y = b$, where b is a constant. $y = 1$ fits this form.

