

QUESTIONS AND CONCLUSIONS

QUESTIONS 9-10

Q1: Tautology is a proposition that is always true.

- I. $(1 \rightarrow 0) \leftrightarrow (0 \rightarrow 1)$
- II. $(0 \rightarrow 1) \leftrightarrow (1 \rightarrow 0)$
- III. $(0 \rightarrow 1) \leftrightarrow (0 \rightarrow 1)$
- IV. $(0 \rightarrow 1)' \leftrightarrow (1 \rightarrow 1)$

For the given propositions above, find their truth values and determine which ones are tautologies. (1 point)

- A) I and II
- B) Only I
- C) Only II
- D) Only III
- E) I and III

Q2: The given open proposition is:

$$p(a) : 2a - 1 > -3 + a, a \in \mathbb{R}$$

What is the set of truth values for the proposition? (1 point)

- A) $(-\infty, -4)$
- B) $(-2, 2)$
- C) $(-2, \infty)$
- D) $(2, \infty)$
- E) $\{0, 1, 2\}$

Q3: Given the set

$$A = \{1, 2, 3, \{2\}, \{a\}, \emptyset\},$$

which of the following is false? (1 point)

- A) $2 \in A$
- B) $\{2\} \in A$
- C) $\{a\} \in A$
- D) $\emptyset \in A$
- E) $A \in A$

Q4: Given the set $A = \{a, b, c, d, e, f\}$

how many subsets contain both "d" and "e" as elements? (1 point)

- A) 4
- B) 6
- C) 8
- D) 16
- E) 32



Q5: Here is the question in a more organized, bullet-point format:

In a school:

- 40% of the students are successful in Mathematics.
- 70% of the students are successful in English.
- 20% of the students are unsuccessful in both subjects.

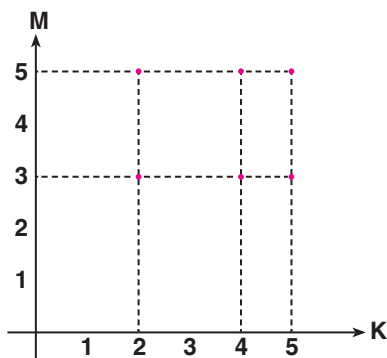
It is given that:

There are 30 students who are successful only in Mathematics.

How many students are successful only in English? (1 point)

- A) 70 B) 80 C) 105 D) 120 E) 140

Q6: The graph of $K \times M$ is given below.



Based on this information, which of the following represents the list notation of the set $K \times M$? (2 points)

- A) $\{(2, 3), (4, 3), (5, 3)\}$
 B) $\{(2, 5), (4, 5), (5, 5)\}$
 C) $\{(3, 2), (3, 4), (3, 5)\}$
 D) $\{(3, 2), (3, 4), (3, 5), (5, 2), (5, 4), (5, 5)\}$
 E) $\{(2, 3), (2, 5), (4, 3), (4, 5), (5, 3), (5, 5)\}$

Q7: The sum of 10 consecutive positive odd numbers is 200.

What is the largest of these numbers?

(2 points)

- A) 29 B) 31 C) 33 D) 35 E) 37

Q8:

$$\frac{12}{2} + \frac{15}{5} + \frac{18}{5} + \frac{21}{5} + \dots + \frac{39}{5}$$

What is the total value of the following expression? (2 points)

- A) 24 B) 35 C) 42 D) 45 E) 51



Q9: Factorial is the product of all natural numbers from “1” to “n” and is denoted as “n!”.

For example:

$$n! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot (n - 1) \cdot n$$

- $2! = 1 \cdot 2$
- $3! = 1 \cdot 2 \cdot 3$
- $4! = 1 \cdot 2 \cdot 3 \cdot 4 = 3! \cdot 4$

What is the value of the expression

$$\frac{11! + 10!}{9!} ? \text{ (2 points)}$$

- A) 9 B) 10 C) 19 D) 110 E) 120

Q10: The three-digit number “2xy” is 4 less than 7 times the two-digit number “xy”.

Based on this, what is the value of the two-digit number “yx”? (2 points)

- A) 24 B) 32 C) 34 D) 38 E) 43

Q11: Let the two real numbers be x and y. The product of x and y is equal to 42.

$$x \cdot y = 42$$

When both numbers are increased by 3, their product increases by 39.

Based on this, how much does their product decrease when both numbers are decreased by 3? (3 points)

- A) 12 B) 15 C) 18 D) 21 E) 39

Q12: Given the rational expressions:

$$\left(1 + \frac{1}{2}\right) \cdot \left(1 + \frac{1}{3}\right) \cdot \left(1 + \frac{1}{4}\right) \cdot \dots \cdot \left(1 + \frac{1}{m}\right)$$

If “m = 41”, what is the result of this multiplication? (3 points)

- A) $\frac{1}{41}$ B) $\frac{1}{21}$ C) $\frac{42}{21}$ D) 21 E) 41

Q13: Given the operation:

$$(13.7 - 2.25) \times 24.42$$

What is the result of this operation? (3 points)

- A) 279.609 B) 279.620
C) 279.690 D) 280.609
E) 282.30

Q14: The ordered pair $(2, -1)$ satisfies the equations:

- $y = x + m$
- $x = 3y - n$

What is the value of “ $m + n$ ”? (3 points)

- A) 2 B) 0 C) -2 D) -6 E) -8

Q15: I. $(276.49)^0$

II. $(3 - 8\sqrt{3})^0$

III. 1^{-5236}

IV. $(x^2 - 16)^0$

V. $(273)^0$

The given exponential expressions are provided above.

How many of them always equal “1”? (3 points)

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

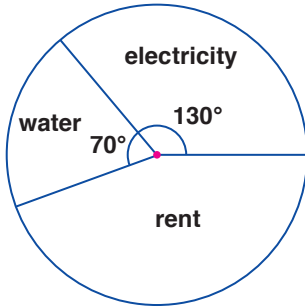
Q16:

$$\frac{4}{3 + \sqrt{7}} + \frac{14}{\sqrt{7}}$$

What is the result of given operation above? (4 points)

- A) $-\sqrt{7}$ B) $\sqrt{7}$ C) 6
D) $6 - 4\sqrt{7}$ E) $6 - \sqrt{7}$

Q17:



The daily costs of electricity, water, and rent for a house are given in a pie chart.

If the total monthly cost of electricity, water, and rent is 1440 USD, what is the electricity bill? (4 points)

- A) 420 B) 520 C) 620 D) 720 E) 820

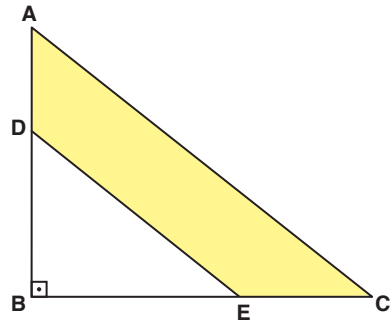
Q18: In a group of 5 students, the average age is 16 years.

When a new student joins the group, the average age decreases to 15.5 years.

What is the age of the new student? (4 point)

- A) 12 B) 13 C) 14 D) 15 E) 16

Q19: ABC is a right angled triangle.



Given:

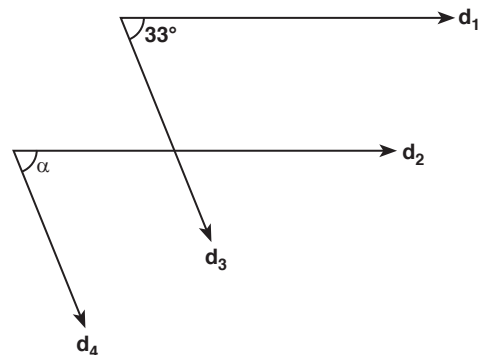
$$|AD| = |BD| = 3$$

$$|BE| = 4, |EC| = 2$$

Based on the given information, what is the area of the shaded region? (4 points)

- A) 9 B) 10 C) 11 D) 12 E) 18

Q20:



$$d_1 \parallel d_2$$

$$d_3 \parallel d_4$$

According to the given figure, what is the value of “ α ”? (4 points)

- A) 30 B) 31 C) 32 D) 33 E) 34

Q21:

$$\frac{\tan 45^\circ + \cot 30^\circ}{\sin 30^\circ}$$

What is the result of the given expression?

(5 points)

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

Q22: A 30-gram saltwater solution contains 20% salt.

Then, 20 grams of water and “x” grams of salt are added.

If the new solution is 60% salt, what is the value of “x”? (5 points)

- A) 80 B) 75 C) 70 D) 65 E) 60

Q23: Given the set

$$A = \{5, 6, 7, 8, 9\},$$

how many different three-digit odd natural numbers can be formed using distinct digits? (5 points)

- A) 36 B) 40 C) 44 D) 48 E) 52

Q24:

$$\frac{n}{4!} + \frac{n}{5!} = 36$$

Considering given the equation, what is the value of “n”? (5 points)

- A) 5! B) 6! C) 7! D) 8! E) 9!

Q25: Given the $A = \{x, y, z\}$ and $B = \{1, 2, 3\}$,

Which of the following represents a valid function from A to B? (5 points)

- A) $f = \{(x, 1), (y, 2), (y, 3)\}$
- B) $f = \{(x, 1), (y, 3), (z, 3)\}$
- C) $f = \{(x, 2), (x, 3), (y, 2)\}$
- D) $f = \{(1, x), (2, z), (3, y)\}$
- E) $f = \{(x, 2), (y, 1)\}$

Q26: Given the function $f : A \rightarrow \{-2, -1, 0, 1, 2\}$, where $f(x) = x - 3$, it is stated that f is onto (surjective).

Accordingly, what is the sum of the elements in set A? (6 points)

- A) 12 B) 15 C) 18 D) 21 E) 24

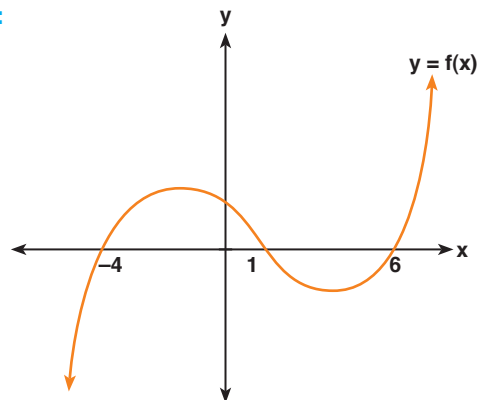
Q27: A function $f(x)$ is defined as follows:

- $f(x) = 2x + 1$ if $x < 0$
- $f(x) = x^2 - 4x$ if $0 \leq x \leq 3$
- $f(x) = 3x - 5$ if $x > 3$

What is the value of $f(-2) + f(2) + f(4)$? (6 points)

- A) 3 B) -1 C) 0 D) 5 E) 7

Q28:



The graph of the function $f(x)$ is given above.

Accordingly, which of the following represents the solution set of the equation $f(x) = 0$ in real numbers? (6 points)

- A) $[-4, 6]$ B) $[-3, 1]$
- C) $\{-4, 1, 6\}$ D) $\{-4, 6\}$
- E) $\{-2, 1, 3\}$

Q29:

$$f\left(\frac{x+5}{x+6}\right) = x - 3$$

Considering given the equation, what is the value of $f(2)$? (6 points)

- A) -10 B) -8 C) -6 D) -4 E) -2

Q30: Given the functions:

- $f(x) = x + 3$
- $g(x) = 3 - x$

What is the value of $(g \circ f)(-3)$? (6 points)

- A) -3 B) -1 C) 0 D) 1 E) 3

Q31: Given the polynomial

$$P(x) = x^2 + x - 3,$$

what is the constant term of the polynomial $P(x + 2)$? (7 points)

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

Q32: Given the quadratic equation:

$$x^2 + mx + (m - 2) = 0$$

The roots satisfy the equations:

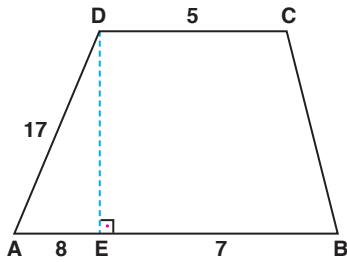
$$4x_1 + x^2 = 8$$

$$3x_1 + x^2 = 5$$

Based on this, what is the value of “m”? (7 points)

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

Q33:

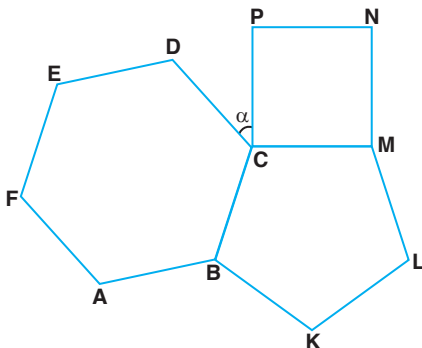


ABCD is a trapezoid, and $[DE] \perp [AB]$
(DE is perpendicular to AB).

Based on the given information in the figure, what is the area of ABCD in cm^2 ? (7 points)

- A) 120 B) 130 C) 140 D) 150 E) 160

Q34:



In the given figure, a regular hexagon, a regular pentagon, and a square are provided.

Based on this information, what is the measure of $m(\widehat{DCP}) = \alpha$ in degrees? (7 points)

- A) 24 B) 30 C) 36 D) 42 E) 48

Q35: The base of an equilateral triangular prism has a side length of 8 cm, and its height is 12 cm.

What is the lateral surface area of the prism in cm^2 ? (7 points)

- A) 288 B) 324 C) 360 D) 396 E) 420