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UIMO
Unified International Mathematics Olympiad

UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD

CLASS - 7

Question Paper Code : UM9264

KEY

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B	C	A	C	A	D	C	A	A	C
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D	B	B	C	B	C	D	B	C	C
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C	A	D	B	D	A	C	D	C	B
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
B,C	A,B,C	A,C	A,B,C,D	A,B,C,D	D	D	D	A	A
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C	A	D	C	A	B	C	A	A	B

EXPLANATIONS

MATHEMATICS - 1

01. (B) $(256)^{0.16} \times (256)^{0.09} = (256)^{0.16 + 0.09}$

$= (4^4)^{0.25}$

$= 4$

02. (C) Given $x + y = 4xy$

$$\frac{x}{xy} + \frac{y}{xy} = \frac{4xy}{xy}$$

$$\frac{1}{x} + \frac{1}{y} = 4$$

03. (A) Let A's amount be ₹x

Given ₹x + ₹x – 16 + 3x = ₹129.

5x = ₹(129 + 16) = ₹145

$\therefore$ A's amount = x = ₹$\frac{145}{5}$ = ₹29

04. (C) $998^2 - 2 \times 998 \times 1002 + 1002^2$

$= 996004 - 1999992 + 1004004$

$= 2000008 - 1999992$

$= 16$

05. (A) Radius of outer circle = 14 cm

$\Rightarrow$ Circumference

$= 2 \times \frac{22}{7} \times 14 = 88$ cm

Radius of inner circle

$= 14 - 3.5 = 10.5$ cm

$\Rightarrow$ Circumference

$= 2 \times \frac{22}{7} \times 10.5$

$= 66$ cm

$\therefore$ Difference of circumferences

$= 88 - 66$ cm

$= 22$ cm

06. (D) Given

$$\frac{27 + x + 31 + x + 98 + x + 105 + x + 164 + x}{5} = 101$$

$425 + 5x = 101 \times 5 = 505$

$5x = 505 - 425 = 80$

$x = \frac{80}{5} = 16$

$\therefore$ Required mean

$$= \frac{\left(\begin{array}{c} 115 + x + 126 - x + 68 - 2x \\ + 73 + 4x + 56 + 5x \end{array}\right)}{5}$$

$$= \frac{438 + 7x}{5} = \frac{438 + 7 \times 16}{5} = \frac{438 + 112}{5}$$

$$= \frac{550}{5} = 110$$

07. (C) $[(43)^3 + 3 \times (43)^2 \times 57 + 3 \times 43 \times (57)^2 + (57)^3]$

$= 79507 + 171 \times 1849 + 129 \times 3249 + 185193$

$= 79507 + 316179 + 419121 + 185193$

$= 10,00,000$

08. (A) Given $y - 5° + 2x + 40° = 2y - x$

$2x + x + 35° = 2y - y$

$3 \times 5° + 35° = y$

$y = 35° + 15° = 50°$

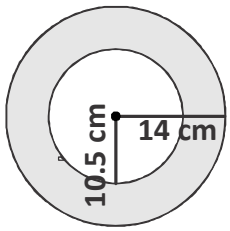
09. (A) $x^2 - 2x - x(x - 1) = x^2 - 2x - x^2 + x = -x$

$= -2022$

10. (C) $\therefore$ LCM $= 5 \times 9 \times 7 \times 23 \times 5 \times 4 = 144900$

5	36225	28980
9	7245	5796
7	805	644
23	115	92
	5	4

11. (D) Given R = 14 cm & r = 10.5 cm



Difference between the area $= \pi R^2 - \pi r^2$

$= \pi(R^2 - r^2)$

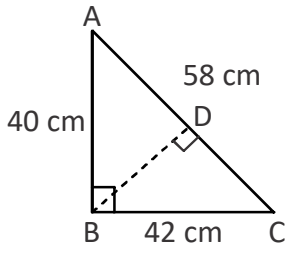
$= \pi(R + r)(R - r)$

$= \frac{22}{7} \times (14 + 10.5)\text{cm}\ (14 - 10.5)\text{cm}$

$= \frac{22}{7} \times 24.5\text{ cm} \times 3.5\text{ cm}$

$= 269.5\text{ cm}^2$

12. (B) In ΔABC, $\angle B = 90°$



$\therefore AC^2 = AB^2 + BC^2$

$58^2 = 40^2 + BC^2$

$3364 = 1600 + BC^2$

$BC^2 = 3364 - 1600$

$BC^2 = 1764$

$BC^2 = (42)^2$

Area of $\Delta ABC = \frac{1}{2} \times AC \times BD = \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times 58 \text{ cm} \times BD = \frac{1}{2} \times 40 \times 42 \text{ cm}^2$

$BD = \frac{1}{2} \times 40 \times 42 \times 2 \times \frac{1}{58}$

$= \frac{840}{29} \text{ cm} = 28\frac{28}{29} \text{ cm}$

13. (B) $(1 + x + x^2 + x^3 + x^4 + \ldots\ldots\ldots + x^{2020}) =$

$1 + (x + x^2 + x^3 + x^4) + (x^5 + x^6 + x^7 + x^8) + \ldots\ldots\ldots\ldots + (x^{2017} + x^{2018} + x^{2019} + x^{2020})$

$= 1 + x(1 + x + x^2 + x^3) + x^5(1 + x + x^2 + x^3)$

$+ \ldots\ldots\ldots\ldots + x^{2017}(1 + x + x^2 + x^3)$

$= 1 + x(0) + x^5(0) + \ldots\ldots + x^{2017}(0)$

$= 1$

14. (C) Let the three consecutive numbers be x, $x + 1$ & $x + 2$

Given $2x + 3(x + 1) + 4(x + 2) = 245$

$2x + 3x + 3 + 4x + 8 = 245$

$9x + 11 = 245$

$9x = 245 - 11 = 234$

$x = \frac{234}{9}$

$\therefore$ The least number = 26

15. (B) Given $l\text{b} = 45\frac{5}{16} \text{ cm}^2$

$7\frac{1}{4} \text{ cm} \times \text{b} = \frac{725}{16} \text{ cm}^2$

$\frac{29}{4} \times \text{b} = \frac{725}{16} \text{ cm}^2$

$\text{b} = \frac{725}{16} \times \frac{4}{29} \text{ cm}$

$\frac{25}{4} \text{ cm} = 6\frac{1}{4} \text{ cm}$

$\therefore$ Perimeter $= 2(l + \text{b}) = 2\left(\frac{29}{4} + \frac{25}{4}\right) \text{cm}$

$= 2\left(\frac{29+25}{4}\right) \text{cm}$

$= 2 \times \left(\frac{54}{4}\right) \text{cm} = 27 \text{ cm}$

16. (C) Given a : b = 2 : 3 = $2x$: $3x$

But $\angle a + \angle b = 180°$

$\therefore 2x + 3x = 180°$

$5x = 180°$

$x = \frac{180°}{5} = 36°$

$\therefore a = 2x = 72°$

$b = 3x = 108°$

$\therefore \angle c = \angle b = 108°$

[corresponding angles]

$\therefore \angle d = 180° - \angle c = 180° - 108° = 72°$

$\therefore \angle c - \angle d = 108° - 72° = 36°$

17. (D) $1 + 2 + 3 + 4 - 5 - 6 - 7 - 8 = 10 - 26 = -16$

$9 + 10 + 11 + 12 - 13 - 14 - 15 - 16$

$= 42 - 58 = -16$

Number of sets of 8 numbers up to 2016

$= \frac{2016}{8} = 252$

$\therefore$ Sum of this 252 sets = $(252) \times (-16)$

$= -4032$

Required result = $-4032 + 2017 + 2108 + 2019 + 2020 - 2021 - 2022 - 2023$

$= -4032 + 8074 - 6066$

$= -2024$

18. (B) Second expression = Sum – first expression

$= (x^3 + x^2 - 3x + 2) - (x^3 - x^2 - 6x - 8)$

$= x^3 + x^2 - 3x + 2 - x^3 + x^2 + 6x + 8$

$= 2x^2 + 3x + 10$

19. (C)

$2x$	$10x^2y,\quad 25x^2y^2,\quad 8xy^2z^3$
$5x$	$5xy,\quad 25xy^2,\quad 4y^2z^3$
y	$y,\quad 5y^2,\quad 4y^2z^3$
y	$1,\quad 5y,\quad 4yz^3$
	$1,\quad 5,\quad 4z^3$

$\therefore$ LCM $= (2x)(5x)(y)(y)(5)(4z^3)$

$= 200x^2y^2z^3$

20. (C) S.A.S. criterion is satisfied if two sides and an included angle of a triangle are equal to the two corresponding sides and included angle of the other

21. (C) $\text{LHS} = -\frac{3}{10} - \frac{9}{10} + \frac{7}{15} - \frac{13}{15} + \frac{3}{20} - \frac{13}{20}$

$= \frac{-3-9}{10} + \frac{7-13}{15} + \frac{3-13}{20}$

$= \frac{-12}{10} - \frac{6}{15} - \frac{10}{20}$

$= \frac{-6}{5} - \frac{2}{5} - \frac{1}{2}$

$= \frac{-12-4-5}{10} = \frac{-21}{10}$

22. (A) $60°$ & y are vertically opposite angles which are equal

$\Rightarrow y = 60°$

In the triangle, $x + 60° + 40° = 180°$

(Angle sum property)

$\Rightarrow x + 100° = 180°$

$\Rightarrow x = 180° - 100° = 80°$

23. (D) Number of marbles Pankaj has = 96

Number of marbles Arun has = 63

Let the number of marbles that Arun should give Pankaj be 'x'

Then according to the problem, $(96 + x)$

$= 2(63 - x)$

$\Rightarrow 96 + x = 126 - 2x$

$\Rightarrow 3x = 126 - 96$

$\Rightarrow 3x = 30 \Rightarrow x = 10$

24. (B) The range of a given data is the difference between its highest and lowest values

From the given data, range

$= 154 - 128 = 26$

25. (D) Given ◯ + ◯ + □ = 11 and

◯ + □ = 8

$\therefore$ ◯ = 11 – 8 = 3

Given ◯ + △ + △ = 15

3 + 2△ = 15

2△ = 15 – 3

2△ = 12

△ = 6

26. (A) $\text{SP} = \frac{5}{4}\text{CP}$

$\text{Profit} = \text{SP} - \text{CP} = \frac{5\text{CP}}{4} - \text{CP}$

$= \frac{5\text{CP} - 4\text{CP}}{4} = \frac{\text{CP}}{4}$

$\therefore$ Profit percentage $= \frac{\text{Profit}}{\text{CP}} \times 100$

$= \frac{\frac{\text{CP}}{4}}{\text{CP}} \times 100$

$= 25\%$

27. (C) Here we equate the areas,

i.e., AB × DL = BC × DM

$\Rightarrow 18 \times \text{DL} = 12 \times 10$

$\Rightarrow \text{DL} = \frac{12 \times 10}{18} = \frac{20}{3} = 6\frac{2}{3}$

28. (D) Given $3x - 9° + 3x + 5x + 2° = 180°$

$11x - 7° = 180°$

$11x = 180° + 7° = 187°$

$x = \frac{187°}{11} = 17°$

$\therefore 3x - 9° = 3 \times 17° - 9 = 51° - 9° = 42°$

$3x = 51°$

$5x + 2° = 5 \times 17° + 2 = 87°$

29. (C) Area of $\Delta CDE = \frac{1}{2} \times CD \times AD$

$= \frac{1}{2} \times 17.8 \text{ cm} \times 11.7 \text{ cm}$

$= 104.13 \text{ cm}^2$

$\therefore$ Area of the shaded region = 104.13 cm^2

(or)

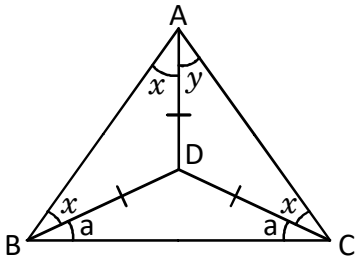
Area of the rectangle – area of ΔCDE

$= 17.8 \times 11.7 \text{ cm}^2 - 104.13 \text{ cm}^2$

$= 208.26 \text{ cm}^2 - 104.13 \text{ cm}^2$

$= 104.13 \text{ cm}^2$

30. (B) In ΔBCD, BD = CD



$\angle BCD = \angle CBD = a$

$\therefore a + a + 110° = 180°$

$2a = 180° - 110° = 70°$

$a = \frac{70}{2} = 35°$

In ΔABD, AD = BD

$\angle ABD = \angle BAD = x$

In ΔACD, AD = CD

$\angle ACD = \angle CAD = y$

In ΔABC,

$\angle DAB + \angle BAD + \angle DAC + \angle ACD + \angle BCD + \angle CBD = 180°$

$x + x + y + y + 35° + 35° = 180°$

$2x + 2y = 180° - 70° = 110°$

$2(x + y) = 110°$

$x + y = \frac{110°}{2} = 55°$

$\therefore \angle BAC = x + y = 55°$

MATHEMATICS - 2

31. (B, C)

An isosceles triangle has one line of symmetry

A rectangle has two lines of symmetry

A square has four lines of symmetry

A trapezium has one line of symmetry.

32. (A, B, C)

Option A it is in the form of p/q where p, q ε z & $q \neq 0$

$\therefore \frac{22}{7}$ is a rational number.

Option B: $1.\overline{56}$ is non terminating but repeating decimal

$\therefore 1.\overline{56}$ is a rational number

Option C: 1.565675678 is a terminating decimal

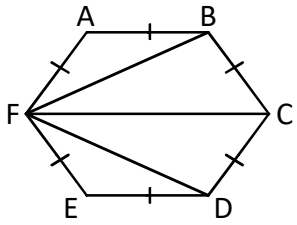
$\therefore$ It is a rational number

Option D: It is neither terminates nor repeats

$\therefore$ It is not a rational number

33. (A, C)

$\Delta AFB \cong \Delta EFD$ [$\because$ SAS congruence's]



In ΔBCF and ΔDCF

BC = CDC (side)

$\angle FCB = \angle DCF = \angle \frac{BCD}{2}$

FC = FC ($\because$ Common side)

$\therefore \Delta BCF \cong \Delta DCF$ [$\because$ SAS congruence's]

34. (A, B, C, D)

All options are true for drawing the parallel lines.

35. (A, B, C, D)

Option A: Given $3^x = 270$

$\therefore\ 3^{x-2} = \dfrac{3^x}{3^2}$

$3^{x-2} = \dfrac{270}{9}$

$\therefore$ Option A true

Option B: $\left(\dfrac{x^a}{x^b}\right)^c \times \left(\dfrac{x^b}{x^c}\right)^a \times \left(\dfrac{x^c}{x^a}\right)^b$

$= \dfrac{x^{ac}}{x^{bc}} \times \dfrac{x^{ab}}{x^{ac}} \times \dfrac{x^{bc}}{x^{ab}} = 1$

$\therefore$ Option B true

Option C : $\left(\dfrac{p}{q}\right) = \dfrac{\left(\frac{2}{3}\right)^3}{\left(\frac{3}{2}\right)^{-3}} = \left(\dfrac{2}{3}\right)^3 \times \left(\dfrac{3}{2}\right)^3$

$= \left(\dfrac{2}{3} \times \dfrac{3}{2}\right)^3$

$= 1^3$

$\therefore \dfrac{p}{q} = 1$

$\therefore \left(\dfrac{p}{q}\right)^{-10} = \dfrac{1}{\left(\frac{p}{q}\right)^{10}} = \dfrac{1}{\left(1^{10}\right)} = 1$

$\therefore$ Option C is true

Option D: Given $2^2 \times (2^3)m = 2^{-7}$

$2^2 \times 2^{3m} = 2^{-7}$

$\therefore 2^{3m+2} = 2^{-7}$

$\therefore 3m+2 = -7$

$3m = -7 - 2$

$3m = -9$

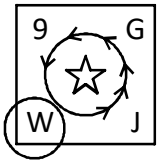
$m = -\dfrac{9}{3} = -3$

REASONING

36. (D) Every time one letter is coded as number from starting position and ending position alternatively.

CHAPTER , 1HAPTER , CHAPTE2 , C3APTER , CHAPT4R , CH5PTER , CHAP6ER

37. (D)



38. (D) If 15th August 2022 is Monday, then 15th August 2023 is Tuesday and 15th August 2024 is Thursday(2024 is a leap year)

16th August 2024—— Friday

17th August 2024—— Saturday

18th August 2024—— Sunday

19th August 2024—— Monday

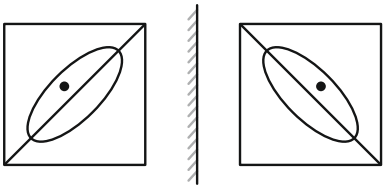
39. (A) The square increases in size and goes in the middle, the circle increases in size and goes at the bottom and the rectangle rotates 90° and goes at the top.

40. (A) The answer is TARIC

Letter	B	E	L	T	S	U	M
Code	M	R	I	C	T	B	A

41. (C) 7 and 8. Any two numbers are as likely as the rest, as the difference between the numbers in the answer options is always one.

42. (A)



43. (D) A = 0 , B = 1 , C = 2 , D = 3 , E = 4 , F = 5 , G = 6 , H = 7 , I = 8 , J = 9

Option (A) 1309 = BDOJ ('O' vowel)

Option (B) 7432 = HEDC ('E' vowel)

Option (C) 6278 = GCHI ('I' vowel)

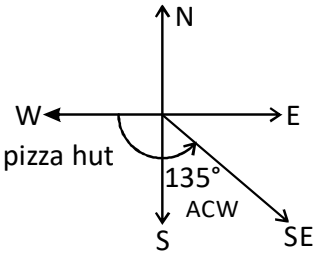
Option (D) 2516 = CFBG

(All letters are consonants)

44. (C) It is given that, Sandeep was facing the pizza hut at the beginning and he turned anti-clockwise to face south-east, then

From the figure, It is clearly shown that the pizza hut is in WEST and moving anti-clockwise from West to South-East. 135° angle is formed

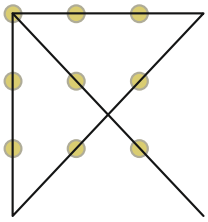
Hence, option (C) is correct



45. (A) It is clear than that F, E, A, B, G, H, C and D is a possible order. It is a possible that 'E' finished before A and it is possible that G and H finish before C. The rest of the ordering is mandated by the constrains.

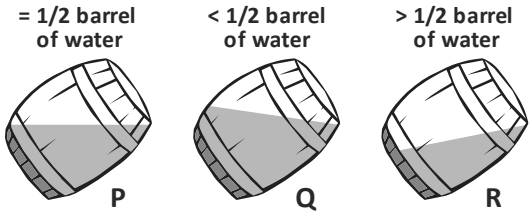
CRITICAL THINKING

46. (B) 4 lines are required to touch each circles without lifting the pen.



47. (C) If Rohit always tells the truth, then both Honey and Rohit speak Tamil (Statements I and II) and Honey is lying (Statement III)

48. (A) As shown in the picture below, you should tilt the barrel so the liquid will touch the upper end of the barrel. So if the bottom part of the barrel is visible then it's not half full.

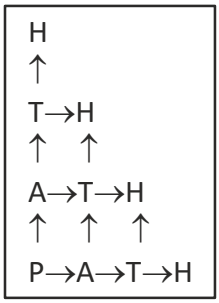


49. (A) Since large numbers of primary schools in the rural areas are run by only one teacher so there has been a huge dropout from the primary schools in rural areas.

50. (B) Total 7 ways

$4 \times 7 = 28$ ways

$\frac{1}{4}^{th}$ part of a diagram is



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