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UIMO
Unified International Mathematics Olympiad

UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD (UPDATED)

CLASS - 7

Question Paper Code : 4O119

KEY

1	2	3	4	5	6	7	8	9	10
D	B	A	C	B	C	B	A	A	A
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
C	C	D	C	D	D	A	C	C	D
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
D	B	D	B	A	C	C	A	A	B
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
A,B,C	A,B,C	A,C,D	A,C,D	A,B,C,D	A	B	D	A	B
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
Delete	A	A	B	C	Delete	A	A	D	C

EXPLANATIONS

MATHEMATICS

01. (D) Given AD||CD, $\angle CDB = \angle ADE = 47°$

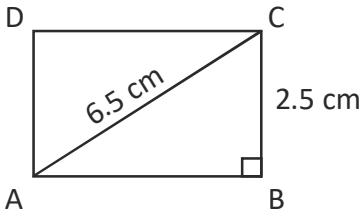
Given CE||EB

$\angle CDB + \angle ECD = 180°$

$47° + \angle ECD = 180°$

$\angle ECD = 180° - 47° = 133°$

02. (B) Given b = 2.5 cm and d = 6.5 cm



According to Pythagorus theorem

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

$6.5^2 = AB^2 + (2.5)^2$

$42.25 = AB^2 + 6.25$

$AB^2 = 42.25 - 6.25$

$AB^2 = 36$

$AB^2 = 6^2$

$\therefore$ $AB = 6cm$

$\therefore$ Area = AB × BC = 6cm × 2.5 cm

$= 15.0\ cm^2$

03. (A) Side of an equilateral triangle

$$= \frac{\text{Perimeter}}{3}$$

$$= \frac{\left(3a - \frac{b}{9} + \frac{c}{81}\right)}{3} cm$$

$$= \left(\frac{3a}{3} - \frac{b}{9}\times\frac{1}{3} + \frac{6}{81}\times\frac{1}{3}\right) cm$$

$$= \left(a - \frac{b}{27} + \frac{c}{243}\right)\ cm$$

04. (C) Given the angles ratio = 8 : 9 : 19 = $8x$: $9x$: $19x$

$\therefore$ $8x + 9x + 19x = 180°$

$36x = 180°$

$x = \frac{180°}{36} = 5°$

$\therefore$ $8x = 8 \times 5° = 40°$

$9x = 9 \times 5° = 45°$ &

$19x = 19 \times 5° = 95°$

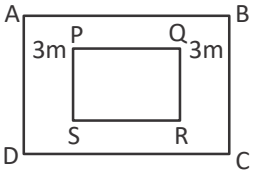
It is an obtuse angled triangle

05. (B) The first 10 composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, 16, 18

$$\text{Mean} = \frac{4+6+8+9+10+12+14+15+16+18}{10}$$

$$= \frac{112}{10} = 11.2$$

06. (C)



Side of square

ABCD = (3 + 24 + 3) m = 30 m

Area of ABCD square

$= 30\ m \times 30\ m = 900\ m^2$

Area of the square PQRS = 24 m × 24 m

$= 576\ m^2$

Area of the path = Area of ABCD – area of PQRS

$= 90\ m^2 - 576\ m^2 = 324\ m^2$

07. (B) $$\frac{0.001 - 0.008}{0.01 + 0.02 + 0.04} = \frac{-0.007}{0.07}$$

$$= \frac{-0.007}{0.07}\times\frac{100}{100}$$

$$= \frac{-0.7}{7} = -0.1$$

08. (A) Let the number ot be divided by be 'x'

Given $\frac{\left(\frac{-3}{2}\right)^{-2}}{x} = \left(\frac{4}{9}\right)^{-3}$

$\Rightarrow \left(\frac{-2}{3}\right)^2 \times \frac{1}{x} = \left(\frac{9}{4}\right)^3$

$\frac{4}{9}\times\frac{1}{x} = \frac{729}{64}$

$\therefore\ x = \frac{4\times64}{9\times729} = \frac{256}{9\times9^3} = \frac{(2^8)}{9^{1+3}} = \frac{2^8}{(3^2)^4} = \frac{2^8}{3^8}$

$= \left(\frac{2}{3}\right)^8$

09. (A) Let 'x' to be subtracted

$\therefore -\frac{3}{2} - x = \frac{5}{14}$

$-\frac{3}{2} - \frac{5}{14} = x$

$\frac{-21-5}{14} = x$

$-\frac{26}{14} = x$

$\therefore\ x = -\frac{13}{7}$

10. (A) Given $8 \times 4^x = \frac{1}{128}$

$4^x = \frac{1}{128} \times \frac{1}{8} = \frac{1}{2^7} \times \frac{1}{2^3} = \frac{1}{2^{10}}$

$(2^2)^x = 2^{-10}$

$2x = -10$

$x = \frac{-10}{2} = -5$

$\therefore \quad \frac{4.5}{x} = \frac{4.5}{-5} = -0.9$

11. (C) Given $2(l + b) = 14$ cm

$l + b = \frac{14 \text{ cm}}{2} = 7$ cm

4 cm + b = 7 cm

b = 7 cm – 4 cm = 3 cm

$d^2 = l^2 + b^2$

$d^2 = 4^2 + 3^2$

$d^2 = 16 + 9$

$d^2 = 25 = 52$

$\therefore$ diagonal = 5 cm

12. (C) –92345 × 9999 = – 92345 (10,000 – 1)

= – 923450000 + 92345

= – 923357655

13. (D) Let the supplimentary angle of $(190 - x)$ by y

Given $190° - x + y = 180°$

$y = 180° + x - 190°$

$= (x - 10°)$

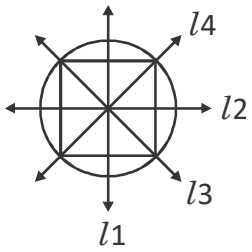
14. (C) Given $2(l + b) = 40$ cm

$\therefore \quad l + b = 20$ cm

Side of large square = $l + b = 20$ cm

$\therefore$ Area of large square = $(l + b)^2 = (20 \text{ cm})^2$ = 400 cm^2

15. (D) Given figure has four lines of symmetry.



16. (D) Let CP of each pen be ₹ x

$\therefore$ CP of 100 pens = 100 ₹ x

$\therefore$ SP of 80 pens = 100 ₹ x

SP of each pen = ₹ $\frac{100x}{80}$ = ₹ $\frac{5x}{4}$

Profit on each pen = SP – CP

= ₹ $\frac{5x}{4}$ – ₹ x

= $\frac{₹\ 5x - ₹\ 4x}{4}$

= $\frac{₹\ x}{4}$

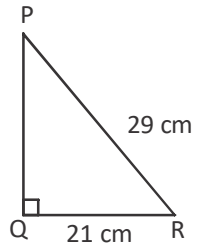
Profit percentage

= $\frac{\text{Profit}}{\text{CP}} \times 100 = \frac{\left(\frac{₹\ x}{4}\right)}{₹\ x} \times 100$

= 25%

17. (A) In ΔPQR, $\angle Q = 90°$

$\therefore \quad PR^2 = PQ^2 + QR^2$



$(29 \text{ cm})^2 = PQ^2 + (21 \text{ cm})^2$

$841 \text{ cm}^2 - 441 \text{ cm}^2 = PQ^2$

$PQ^2 = 400 \text{ cm}^2 = (20 \text{ cm})^2$

PQ = 20 cm

18. (C) Option 'C' has exactly two lines of symmetry.

19. (C) LHS = 1 + 2 + 3 + 4 – 5 – 6 – 7 – 8 + 9 + 10 + 11 + 12 – 13 – 14 – 15 – 16 + ... 2017 + 2018 + 2019 + 2020 – 2021 – 2022 – 2023 – 2024 + 2025 + 2026

= (1 + 2 + 3 + 4 – 5 – 6 – 7 –8) + (10 + 11 + 12 – 13 – 14 – 15 – 16) + ... + (2009 + 2010 + 2011 + 2012 – 2013– 2014 – 2015 – 2016) + 2017 + 2018 + 2019 + 2020 – 2021 – 2022 – 2023 – 2024 + 2025 + 2026

$$= \underbrace{(-16)+(-16)+(-16).....+(-16)}_{253 \text{ times}} + 4051$$

= –16 × 253 + 4051

= –4048 + 4051

= 3

20. (D) $10^x \times 100^{2x} = 1000^5$

$10^x \times (10^2)^{2x} = (10^3)^5$

$10^{x+4x} = 10^{15}$

$5x = 15$

$x = 3$

21. (D) LHS = $\frac{5}{8}\text{of}\frac{24}{25} \div \left[\frac{5}{3}+\frac{1}{2}\left\{\frac{3}{4}\div\left(\frac{8}{5}\times\frac{5}{2}\right)-\frac{4}{3}\right\}\right]$

$$= \frac{3}{5} \div \left[\frac{5}{3}+\frac{1}{2}\left\{\frac{3}{4}\times\frac{1}{4}-\frac{4}{3}\right\}\right]$$

$$= \frac{3}{5} \div \left[\frac{5}{3}+\frac{1}{2}\left\{\frac{9-64}{48}\right\}\right]$$

$$= \frac{3}{5} \div \left[\frac{5}{3}-\frac{55}{96}\right]$$

$$= \frac{3}{5} \div \left[\frac{160-55}{96}\right]$$

$$= \frac{3}{5} \times \frac{96}{105}$$

$$= \frac{96}{175}$$

22. (B) Given ∠C : ∠D = 2 : 1 = $2x : x$

But ∠c + ∠d = 180°

$3x = 180° \Rightarrow x = 60°$

∠c = $2x$ = 120°

∠a – ∠b = ∠c – d = 120° – 60° = 60°

23. (D) Given $8x + 13x + 45° + 17x + 40° = 180°$

$38x + 85° = 180°$

$38x = 180° - 85°$

$38x = 95°$

$x = \frac{95°}{38} = \frac{5°}{2} = 2.5°$

$\therefore 8x = 8 \times 2.5° = 20°$

$13x + 45° = 13 \times 2.5° + 45° = 32.5° + 45° = 77.5°$

$17x + 40° = 17 \times 2.5° + 40° = 42.5° + 40° = 82.5°$

∴ Required sum = 82.5° + 20° = 102.5°

24. (B) From the figure,

$145 - x + 65 - x + x = 180°$

$\Rightarrow x = 210° - 180° = 30°$

Since AE || BD, $y = x$ as they are alternate angles

In ΔBCD, ∠BDC = x (Alternate angles)

$65 - x + x + z = 180°$

$\Rightarrow 65 + z = 180°$

$\Rightarrow z = 115°$

∴ The required sum = $x + y + z$

= 30° + 30° + 115° = 175°

25. (A) Salary of Rahul

Ram : Ajay

$7^2 : 17^2$

49 : 289

490 : 2890

$= \frac{490 \times 17}{7}$ = Rs. 1190

Therefore, salary of Ajay

$= \frac{1190 \times 17}{7}$ = Rs. 2890

26. (C) Smallest whole number = zero

2026^{th} whole number = 2025

∴ Range = 2025 – 0 = 2025

27. (C) $\frac{-3}{4} = -0.75, \frac{-7}{12} = -0.583$

$\frac{-19}{24} = -0.791, \frac{-5}{16} = -0.3125$

$\therefore -0.791 < -0.75 < -0.583 < -0.3125$

$\therefore \frac{-19}{24}$ is the smallest rational number

28. (A) Area of four walls = LSA of a cuboid

= 2h(l × b)

= 2 × 6m(10 + 5) m

= 180 m2

Total cost for painting = 180 m^2 × $\frac{Rs.\,4}{m^2}$

= Rs. 720

29. (A) Let the principal be Rs. P

Given Amout = $Rs.\frac{41}{40}P$

Interest = A – P = $Rs.\frac{41}{40}P - P$

$= \frac{41P - 40P}{40} = \frac{P}{40}$

But $I = \frac{PTR}{100}$

$\frac{P}{40} = \frac{P \times \frac{1}{4} \times R}{100}$

$R = \frac{P}{40} \times 100 \times \frac{4}{P}$

R = 10%

30. (B) –125 × 521 = –65,125

–136 × 515 = –70,040

–116 × 518 = –60,088

–145 × 468 = –68,860

∴ Option 'B' is the smallest

MATHEMATICS 2

31. (A,B,C)

$2^{6078} = 2^{3 \times 2026} = (2^3)^{2026} = 8^{2026}$

$3^{4052} = 3^{2\times2026} = (3^2)^{2026} = 9^{2026}$

$\therefore 9^{2026} > 8^{2026} \Rightarrow 3^{4052} > 2^{6078}$

i.e $2^{6078} < 3^{4052}$

$4^{1013} = (2^2)^{1013} = 2^{2\times1013} = 2^{2026}$

$\therefore 2^{2025} < 2^{2026}$ i.e $2^{2025} < 4^{1013}$

$(0.1)^3 = 0.001$ and $(0.1)^2 = 0.01$

$\therefore (0.1)^3 < (0.1)^2$

Similarly $(0.1)^{2026} < (0.1)^{2025}$

$9^{50} = (3^2)^{50} = 3^{2\times50} = 3^{100}$

$\therefore 3^{100} > 3^{99}$ i.e $9^{50} > 3^{99}$

32. (A,B,C)

The given expression, 3p – 2 = 7 can be expressed as 2 is subtracted from 3p to get 7, difference of 3p and 2 for 3p > 2 to get the result as 7.

But 3p is 7 more than 2 gives expression as 3p = 7 + 2

Hence, 3p is not 2 less than 7.

33. (A,C,D)

Options A, C and D are true.

34. (A,C,D)

Zero has 'no' reciprocal.

Some rational numbers are having reciprocals.

35. (A,B,C,D)

Option A $\frac{2(x+4)+3(1+2x)}{4} = 0$

$2x + 8 + 3 + 6x = 0 \times 4$

$8x + 11 = 0$

$8x = -11$

$x = \frac{-11}{8}$

Option 'B'

$\frac{7(3p+2)-5(4p-3)+p-1}{35} = 4$

$21p + 14 - 20p + 15 + p - 1 = 4 \times 35$

$2p + 28 = 140$

$2p = 140 - 28$

$p = \frac{112}{2} = 56$

Option 'c' $\frac{x}{3} - \frac{2x}{5} - \frac{2x}{3} = -\frac{11}{30}$

$-\frac{x}{3} - \frac{2x}{5} = -\frac{11}{30}$

$\frac{-5x - 6x}{15} = \frac{-11}{30}$

$-11x = \frac{-11}{30} \times 15$

$-x = \frac{-11}{2} \times \frac{1}{1} \Rightarrow x = \frac{1}{2}$

Option 'D' : $1.32y + 0.02y - = 0.595$

$1.34y - y = 0.595$

$0.34y = 0.595$

$y = \frac{0.595}{0.34} \times \frac{1000}{1000}$

$y = \frac{595}{340} = \frac{7}{4}$

REASONING

36. (A) 

37. (B) T is seventh letter to the right of M. Similarly, the seventh letter to the right of G is N.

38. (D) Start at (0,0), facing North.

1. Walk 10 m North → (0,10).

2. Turn left → now facing West; walk 5 m → (–5,10).

3. Turn left → now facing South; walk 10 m → (–5,0).

4. Turn right → now facing West; walk 10 m → (–15,0).

Final position is (–15,0) which is due West of start.

39. (A) Map letters pairwise from ends toward center: A ↔ Z, L ↔ O, T ↔ G, E ↔ V, R ↔ I, E ↔ V, D ↔ W. That's (letter → its "opposite" in alphabet): A ↔ Z, B ↔ Y, C ↔ X, etc. Apply to RELATED :

R → I

E → V

L → O

A → Z

T → G

E → V

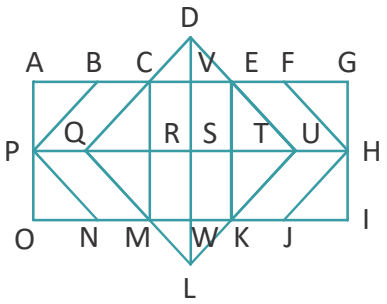
D → W

So RELATED → IVOZGVW.

40. (B) 

41. Delete

42. (A) The figure may be labelled as shown.



Simpliest rectangles

CVSR, VETS, RSWM and STKW → 4

Rectangles composed of 2

CETR,, VEKW, RTKM and CVWM → 4

Rectangles composed of 3

ACRP, PRMO, EGHT and THIK → 4

Rectangles composed of 4

CEKM, AVSP, PSWO, VGHS and SHIW → 5

Rectangles composed of 5

AETP, PTKO, CGHR and RHIM → 4

Rectangles composed of 6 ACMO

and EGIK → 2

Rectangles composed of 8

AGHP, PHIO, AVWO and VGIW → 4

Rectangles composed of 10 AEKO

and CGIM → 2

Rectangles composed of 16 - AGIO → 1

Total number of rectangles 30

43. (A) In the last figure, we can visualize that pattern will be in center only and that too triangular figures only.

44. (B) The two shapes are attached to each other and the colours switch places. i.e., orange becomes white and white becomes orange.

45. (C) The words in each pair are antonyms.

CRITICAL THINKING

46. Delete

47. (A) The fathers statement implies that Raj is capable of cracking IIT exam if he puts in hard work, suggesting that Assumpting (I) is implicit. Assumption (II) is not supported or implied by the statement.

48. (A) 15 August 1947 was a Friday. India's Independence Day is celebrated on 15 August 1947. Historical records and calendar calculations confirm that 15 August 1947 was a Friday.

49. (D) Let the number of students be p.

$4p + 48 = 6p - 8$

$48 + 8 = 6p - 4p$

$2p = 56$

$p = 56 \div 2 = 28$

She gives the sweets to 28 students.

50. (C) Here, both Hindi and Kannada come under Languages and both are different. Hence, the diagram will be