



Unified International
Mathematics Olympiad

UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD

CLASS - 7

Question Paper Code : 40119

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
D	A	A	B	C	B	A	A	D	C

EXPLANATIONS

MATHEMATICS

01. (D) Given $AD \parallel CD$, $\angle CDB = \angle ADE = 47^\circ$

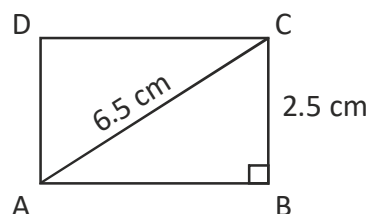
Given $CE \parallel EB$

$$\angle CDB + \angle ECD = 180^\circ$$

$$47^\circ + \angle ECD = 180^\circ$$

$$\angle ECD = 180^\circ - 47^\circ = 133^\circ$$

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



According to Pythagoras theorem

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

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

$$42.25 = AB^2 + 6.25$$

$$AB^2 = 42.25 - 6.25$$

$$AB^2 = 36$$

$$AB^2 = 6^2$$

$$\therefore AB = 6\text{cm}$$

$$\therefore \text{Area} = AB \times BC = 6\text{cm} \times 2.5\text{ cm} \\ = 15.0\text{ cm}^2$$

03. (A) Side of an equilateral triangle

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

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

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

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

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

$$\therefore 8x + 9x + 19x = 180^\circ$$

$$36x = 180^\circ$$

$$x = \frac{180^\circ}{36} = 5^\circ$$

$$\therefore 8x = 8 \times 5^\circ = 40^\circ$$

$$9x = 9 \times 5^\circ = 45^\circ \text{ \&}$$

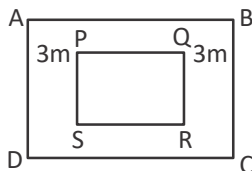
$$19x = 19 \times 5^\circ = 95^\circ$$

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

$$ABCD = (3 + 24 + 3) \text{ m} = 30 \text{ m}$$

Area of ABCD square

$$= 30 \text{ m} \times 30 \text{ m} = 900 \text{ m}^2$$

$$\text{Area of the square PQRS} = 24 \text{ m} \times 24 \text{ m}$$

$$= 576 \text{ m}^2$$

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

$$= 90 \text{ m}^2 - 576 \text{ m}^2 = 324 \text{ m}^2$$

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

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

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

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

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

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

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

$$\therefore x = \frac{4 \times 64}{9 \times 729} = \frac{256}{9 \times 9^3} = \frac{(2^8)}{9^{1+3}} = \frac{2^8}{(3^2)^4} = \frac{2^8}{3^8}$$

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

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

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

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

$$2x = -10$$

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

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

11. (C) Given $2(l + b) = 14 \text{ cm}$

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

$$4 \text{ cm} + b = 7 \text{ cm}$$

$$b = 7 \text{ cm} - 4 \text{ cm} = 3 \text{ cm}$$

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

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

$$d^2 = 16 + 9$$

$$d^2 = 25 = 5^2$$

$$\therefore \text{diagonal} = 5 \text{ cm}$$

12. (C) $-92345 \times 9999 = -92345 (10,000 - 1)$

$$= -923450000 + 92345$$

$$= -923357655$$

13. (D) Let the supplementary angle of $(190 - x)$ be y

$$\text{Given } 190^\circ - x + y = 180^\circ$$

$$y = 180^\circ + x - 190^\circ$$

$$= (x - 10^\circ)$$

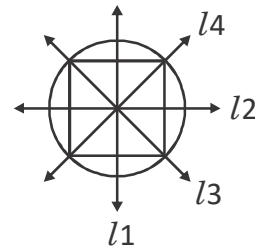
14. (C) Given $2(l + b) = 40 \text{ cm}$

$$\therefore l + b = 20 \text{ cm}$$

$$\text{Side of large square} = l + b = 20 \text{ cm}$$

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

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



16. (D) Let CP of each pen be ₹ x

$$\therefore \text{CP of 100 pens} = 100 \text{ ₹ } x$$

$$\therefore \text{SP of 80 pens} = 100 \text{ ₹ } x$$

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

$$\text{Profit on each pen} = \text{SP} - \text{CP}$$

$$= \text{₹ } \frac{5x}{4} - \text{₹ } x$$

$$= \frac{\text{₹ } 5x - \text{₹ } 4x}{4}$$

$$= \frac{\text{₹ } x}{4}$$

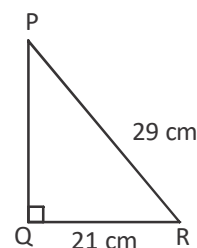
$$\text{Profit percentage}$$

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

$$= 25\%$$

17. (A) In $\triangle PQR$, $\angle Q = 90^\circ$

$$\therefore \text{PR}^2 = \text{PQ}^2 + \text{QR}^2$$



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

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

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

$$\text{PQ} = 20 \text{ cm}$$

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

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

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

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

$$= -16 \times 253 + 4051$$

$$= -4048 + 4051$$

$$= 3$$

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 $\angle C : \angle D = 2 : 1 = 2x : x$

But $\angle c + \angle d = 180^\circ$

$$3x = 180^\circ \Rightarrow x = 60^\circ$$

$$\angle c = 2x = 120^\circ$$

$$\angle a - \angle b = \angle c - d = 120^\circ - 60^\circ = 60^\circ$$

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

$$38x + 85^\circ = 180^\circ$$

$$38x = 180^\circ - 85^\circ$$

$$38x = 95^\circ$$

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

$$\therefore 8x = 8 \times 2.5^\circ = 20^\circ$$

$$13x + 45^\circ = 13 \times 2.5^\circ + 45^\circ = 32.5^\circ + 45^\circ = 77.5^\circ$$

$$17x + 40^\circ = 17 \times 2.5^\circ + 40^\circ = 42.5^\circ + 40^\circ = 82.5^\circ$$

$$\therefore \text{Required sum} = 82.5^\circ + 20^\circ = 102.5^\circ$$

24. (B) From the figure,

$$145 - x + 65 - x + x = 180^\circ$$

$$\Rightarrow x = 210^\circ - 180^\circ = 30^\circ$$

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

In $\triangle BCD$, $\angle BDC = x$ (Alternate angles)

$$65 - x + x + z = 180^\circ$$

$$\Rightarrow 65 + z = 180^\circ$$

$$\Rightarrow z = 115^\circ$$

$$\therefore \text{The required sum} = x + y + z$$

$$= 30^\circ + 30^\circ + 115^\circ = 175^\circ$$

25. (A) Salary of Rahul

Ram : Ajay

$$7^2 : 17^2$$

$$49 : 289$$

$$490 : 2890$$

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

Therefore, salary of Ajay

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

26. (C) Smallest whole number = zero

$$2026^{\text{th}} \text{ whole number} = 2025$$

$$\therefore \text{Range} = 2025 - 0 = 2025$$

MATHEMATICS 2

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

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

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

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

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

$$= 2h(l + b)$$

$$= 2 \times 6m(10 + 5) m$$

$$= 180 \text{ m}^2$$

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

$$= \text{Rs. } 720$$

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

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

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

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

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

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

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

$$R = 10\%$$

30. (B) $-125 \times 521 = -65,125$

$$-136 \times 515 = -70,040$$

$$-116 \times 518 = -60,088$$

$$-145 \times 468 = -68,860$$

$\therefore$ Option 'B' is the smallest

31. (A,B,C)

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

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

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

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

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

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

$$(0.1)^3 = 0.001 \text{ and } (0.1)^2 = 0.01$$

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

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

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

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

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)

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

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

$$8x + 11 = 0$$

$$8x = -11$$

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

Option 'B'

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

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

$$2p + 28 = 140$$

$$2p = 140 - 28$$

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

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

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

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

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

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

$$\text{Option 'D'} : 1.32y + 0.02y - = 0.595$$

$$1.34y - y = 0.595$$

$$0.34y = 0.595$$

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

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

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 $\rightarrow$ (0,10).

2. Turn left $\rightarrow$ now facing West; walk 5 m $\rightarrow$ (-5,10).

3. Turn left $\rightarrow$ now facing South; walk 10 m $\rightarrow$ (-5,0).

4. Turn right $\rightarrow$ now facing West; walk 10 m $\rightarrow$ (-15,0).

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

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

R $\rightarrow$ I

E $\rightarrow$ V

L $\rightarrow$ O

A $\rightarrow$ Z

T $\rightarrow$ G

E $\rightarrow$ V

D $\rightarrow$ W

So RELATED $\rightarrow$ IVOZGVW.



40. (B)

41. (D) Swapping + and $\times$:

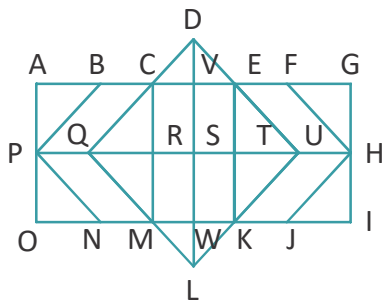
$$8 \times 6 + 2 - 4 \div 2$$

$$= 48 + 2 - 2 = 48$$

Check other options. A gives correct output:

$$8 \times 6 + 2 - 4 \div 2 = 48 + 2 - 2 = 48$$

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 $\rightarrow 4$

Rectangles composed of 6 ACMO
and EGIK → 2

Rectangles composed of 8

AGHP, PHIO, AVWO and VGIW $\rightarrow 4$

Rectangles composed of 10 AEKO
and CGIM $\rightarrow 2$

Rectangles composed of 16 - AGIO $\rightarrow$ 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. (B) To form a cuboid, shapes must have the same number of unit cubes and fit together without gaps or steps.

Shape 2 has an L-shaped gap.

Shape 3 has a matching projection.

When shapes 2 and 3 are joined, the projection fills the gap perfectly, forming a solid with flat rectangular faces. So, shapes 2 and 3 form a cuboid.

47. (A) The fathers statement implies that Raj is capable of cracking IIT exam if he puts in hard work, suggesting that Assuming (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

