



Unified International
Mathematics Olympiad

UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD (UPDATED)

CLASS - 7

Question Paper Code : UM9274

KEY

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

EXPLANATIONS

MATHEMATICS - 1 (MCQ)

1. (B) CP = CP of 40 mts thread

P = CP of 8 mts thread

Profit% =

$$\frac{P}{CP} \times 100 = \frac{\text{CP of 8 mts thread}}{\text{CP of 40 mts thread}} \times 100 = 20\%$$

2. (D) Remaining part = $1 - \left(\frac{1}{3} + \frac{1}{6}\right) = \frac{1}{2}$

Average rate % per annum (R)

$$= \left(\frac{1}{3} \times 3\right) + \left(\frac{1}{6} \times 6\right) + \left(\frac{1}{2} \times 8\right) = 6\%$$

S.I = ₹ 600

T = 2 years, P = ?

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

$$\Rightarrow P = \frac{100 \times I}{TR} = \frac{100 \times 600}{2 \times 6}$$

= ₹ 5000

3. (C) $xy - x - y + 1 = 1$
 $y(x - 1) - 1(x - 1) = 1$
 $(y - 1)(x - 1) = 1$
 as x and y are integers, $x - 1$ and $y - 1$ are integers.

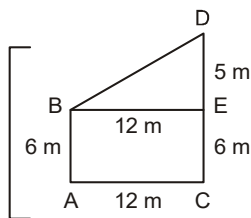
Hence, $x - 1$ and $y - 1$ must both be 1 or -1.

i.e, $x = 2, y = 2$ or $x = 0, y = 0$

Hence only 2 integer pairs satisfy the condition $x + y = xy$

Note: $2 + 2 = 2 \times 2$ and $0 + 0 = 0 \times 0$, remember $0 \times 0 = 0$ but $0 \div 0$ is not defined.

4. (C) $AB = 6$ m, $CD = 11$ m, $AC = 12$ m
 Now, $DE = (CD - CE) = (11 - 6)$ m = 5 m



In $\triangle BED$,

$$BD^2 = BE^2 + DE^2$$

$$= (12)^2 + (5)^2$$

$$= 144 + 25 = 169$$

$$\therefore BD = 13 \text{ m}$$

\therefore Answer is option (C).

5. (C) Distance covered in 1 revolution =

$$\frac{88 \times 1000}{1000} \text{ m} = 88 \text{ m}$$

$$2\pi R = 88$$

$$\Rightarrow 2 \times \frac{22}{7} \times R = 88$$

$$\Rightarrow R = \left(88 \times \frac{7}{44} \right) = 14$$

$$\therefore \text{Diameter} = 2R = (2 \times 14) \text{ m} = 28 \text{ m}$$

6. (D) The arithmetic mean (average) of 3^{10} , 3^{20} and 3^{30} is

$$\frac{3^{10} + 3^{20} + 3^{30}}{3} = \frac{3^{10}}{3} + \frac{3^{20}}{3} + \frac{3^{30}}{3}$$

$$= 3^9 + 3^{19} + 3^{29}$$

7. (D) Given $\angle AOD + \angle DOB = 180^\circ$

$$2x + 3x = 180^\circ$$

$$x = 36^\circ$$

Given $\angle DOB = 3x$

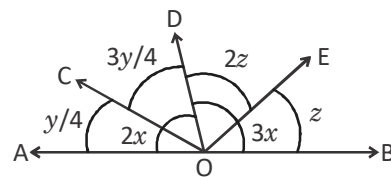
$$\Rightarrow \angle DOG + \angle EOB = 3x$$

$$2z + z = 3x$$

$$3z = 3x$$

$$\therefore z = x$$

$$\therefore x = z = 36^\circ$$



Given $\angle AOD = 2x$

$$\Rightarrow \angle AOC + \angle COD = 2x.$$

$$\frac{y}{4} + \frac{3y}{4} = 2x$$

$$y = 2x$$

$$\therefore \angle COE = \angle COD + \angle DOE = \frac{3y}{4} + 2z = \frac{3}{4}(2x) + 2x$$

$$= \frac{3x}{2} + 2x = \frac{7x}{2}$$

$$= \frac{7 \times 36^\circ}{2} = 126^\circ$$

8. (B) $\frac{25}{19} = 1 + \frac{6}{19}$

$$= 1 + \frac{1}{\left(\frac{19}{6}\right)}$$

$$\therefore P + \frac{1}{q + \frac{1}{r}} = 1 + \frac{1}{3 + \frac{1}{6}}$$

$$\therefore r = 6$$

9. (B) Cost of one litre milk

$$= \frac{\left(\frac{\text{₹} 5157}{20} \right)}{\frac{27}{5}} = \frac{\text{₹} 5157}{20} \times \frac{5}{27}$$

∴ Cost of $3\frac{3}{4}$ litres

$$= \frac{\text{₹} 5157}{4} \times \frac{1}{27} \times \frac{15}{4} = \frac{\text{₹} 2865}{16} = \text{₹} 179\frac{1}{16}$$

10. (B)

$$\text{Mean} = \frac{25+26++25+27+30+28+31+27+33+27+29}{11}$$

$$= \frac{308}{11} = 28$$

$$\text{Mode} = 27$$

$$\text{Mean} - \text{Mode} = 28 - 27 = 1$$

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

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

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

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

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

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

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

12. (C) $(-1)^{2023} + (-1)^{2024} = -1 + 1 = 0$

13. (D) Given $4x - 7 = 2x + 5$

$$2x = 12$$

$$x = 6$$

∴ $2x + 5 = 2(6) + 5 = 12 + 5 = 17 \text{ cm}$

14. (D) Given $x + 3x = 90^\circ$

$$4x = 90^\circ$$

$$x = \frac{90^\circ}{4} = 22.5$$

$$3x = 67.5^\circ$$

15. (D) $4 \left(\frac{4x+1}{2} \right)^{\frac{1}{3}} = 2^{-5}$

$$2^2 \left(\frac{4x+1}{6} \right) = 2^{-5}$$

$$\frac{4x+1}{3} = -5$$

$$4x + 1 = -15$$

$$4x = -16$$

$$x = -4$$

16. (A) ΔPQR is equilateral.

∴ Each of its angles is 60°

∴ $x = 60^\circ + 60^\circ = 120^\circ$

In ΔPRS , $PR = RS$

$$\Rightarrow x + y + y = 180^\circ$$

$$120^\circ + 2y = 180^\circ$$

$$\Rightarrow y = \frac{180^\circ - 120^\circ}{2} = 30^\circ$$

17. (B) Required simplified value

$$= \frac{2}{3}ab - \frac{5}{7}bc - \frac{2ac}{3} - \frac{3}{2}bc + \frac{3}{5}ab + \frac{5}{2}ca$$

$$= \left(\frac{2}{3}ab + \frac{3}{5}ab \right) + \left(-\frac{5}{7}bc - \frac{3}{2}bc \right) + \left(-\frac{2ac}{3} + \frac{5ca}{2} \right)$$

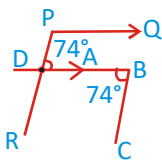
$$= \left(\frac{10ab+9ab}{15} \right) + \left(\frac{-10bc-21bc}{14} \right) + \left(\frac{-4ac+15ac}{6} \right)$$

$$\left(\frac{19ab}{15} - \frac{31bc}{14} + \frac{11ca}{6} \right)$$

18. (B) $\text{LHS} = \frac{0.000064 - 0.000027}{0.0016 + 0.0012 + 0.0009}$

$$= \frac{0.000037}{0.0037} = 0.01$$

19. (A) Given $PR \parallel BC \Rightarrow \angle B = \angle BDP = 74^\circ$



[\because Alternative angles]

Given $AB \parallel PQ$

i.e., $DB \parallel PQ \Rightarrow \angle BDP + \angle P = 180^\circ$

$$74 + \angle P = 180^\circ$$

$$\angle P = 180^\circ - 74^\circ = 106^\circ$$

20. (C) In $\triangle ABC$, $\angle A + \angle B + \angle C = 180^\circ$

$$\Rightarrow 3\angle C + 2\angle C + \angle C = 180$$

$$6\angle C = 180^\circ$$

$$\angle C = \frac{180^\circ}{6} = 30^\circ$$

$$\therefore \angle A = 3\angle C = 90^\circ$$

21. (D) Side of square = $\frac{48 \text{ cm}}{4} = 12 \text{ cm}$

$$\text{Area of square} = a^2 = (12 \text{ cm})^2 = 144 \text{ cm}^2$$

$$\text{Given } \frac{1}{2} \times 2x \times 48 \text{ cm}^2 = 144 \text{ cm}^2$$

$$x = \frac{144 \text{ cm}^2}{48 \text{ cm}} = 3 \text{ cm}$$

22. (A) New radius (R) = 3r

New circumference

$$= 2\pi R = 2\pi(3r) = 3(2\pi r) = 3c$$

23. (B) Let the number to be multiplied be x

$$\therefore \left(\frac{7}{3}\right)^{-2} x = \left(\frac{5}{3}\right)^{-3}$$

$$\Rightarrow \left(\frac{3}{7}\right)^2 x = \left(\frac{3}{5}\right)^3$$

$$\frac{9}{49} x = \frac{27}{125}$$

$$x = \frac{27^3}{125} \times \frac{49}{9}$$

$$= \frac{147}{125}$$

24. (A) $\angle D = \angle E$ [\because Corresponding angles]

$$\therefore \angle D = x = 47^\circ$$

$$\text{In } \triangle ACD, y + x + 108^\circ = 180^\circ$$

$$y + 47^\circ + 108^\circ = 180^\circ$$

$$y = 180^\circ - 155^\circ = 25^\circ$$

25. (B) $2^{3^{64}} = 2^{3^{2 \times 32}} = 2^{(3^2)^{32}} = 2^{9^{32}}$

26. (B) Let the first part be ₹ x

$$\therefore \text{second part} = ₹ (45000 - x)$$

$$\text{Given } 10\% ₹ x = 5\% \text{ of } ₹ (45,000 - x)$$

$$\Rightarrow \frac{10^2}{100} \times ₹ x = \frac{5}{100} \times ₹ (45000 - x)$$

$$2x + x = ₹ 45000$$

$$3x = ₹ 45000$$

$$x = \frac{₹45000}{3} = ₹15,000$$

$$\therefore \text{Bigger part} = ₹ (45000 - x) = ₹ 30,000$$

27. (B) Let x & y are supplementary angles

$$\text{Given } y = 3x$$

$$\text{But } x + y = 180^\circ$$

$$x + 3x = 180^\circ$$

$$4x = 180^\circ$$

$$x = \frac{180^\circ}{4} = 45^\circ$$

$$y = 3x = 3 \times 45^\circ = 135^\circ$$

28. (C) Given $CD \parallel AB \Rightarrow \angle DCE = \angle B = 60^\circ$

$$\text{In } \triangle ABC, 55^\circ + 60^\circ + \angle ACB = 180^\circ$$

$$\angle ACB = 180^\circ - 115^\circ = 65^\circ$$

29. (D) Sum of other two angles

$$= 180^\circ - 73^\circ = 107^\circ$$

30. (B) LCM of 3, 4, 6, 12 and 24 is 24

$$\therefore -\frac{5}{6} = -\frac{20}{24}, -\frac{3}{4} = -\frac{18}{24}, -\frac{2}{3} = -\frac{16}{24}, -\frac{17}{12} = -\frac{34}{24}$$

$$\therefore -\frac{14}{24} > -\frac{16}{24} > -\frac{18}{24} > -\frac{19}{24} > -\frac{20}{24}$$

$$\text{i.e., } -\frac{7}{12} > -\frac{2}{3} > -\frac{3}{4} > -\frac{19}{24} > -\frac{5}{6}$$

MATHEMATICS - 2 (MAQ)

31. (A, B, C) Let the smallest angle be 'x'
 \therefore Sum of other two angles = $180 - x$

$$\text{Given } x = \frac{1}{5}(180^\circ - x)$$

$$5x = 180^\circ - x$$

$$5x + x = 180^\circ$$

$$6x = 180^\circ$$

$$\text{smallest angle } (x) = \frac{180^\circ}{6} = 30^\circ$$

Required angles of a triangle are $30^\circ, 45^\circ, 105^\circ$; $30^\circ, 65^\circ, 85^\circ$; $30^\circ, 50^\circ, 100^\circ$

32. (A, B, C, D)

$$\text{Option (A): } \left(y^{\frac{2}{3}}\right)^9 = y^{\frac{2}{3} \times 9} = y^6$$

$$\text{Option (B): } \left[\left(y^6\right)^{\frac{1}{2}}\right]^2 = y^{6 \times \frac{1}{2} \times 2} = y^6$$

$$\text{Option (C): } \left(y^{\frac{1}{3}}\right)^{18} = y^{\frac{1}{3} \times 18} = y^6$$

$$\text{Option (D): } \frac{y^{18} \times y^{\frac{1}{2}}}{\left(y^{\frac{25}{2}}\right)} = y^{18} \times y^{\frac{1}{2} - \frac{25}{2}} = y^6$$

33. (A, B, D) $\frac{1}{3} = 0.33, \frac{1}{4} = 0.25$

$$\frac{7}{24} = 0.29 \text{ lies between } 0.25 \text{ and } 0.33.$$

0.33.

$$\frac{13}{48} = 0.27 \text{ lies between } 0.25 \text{ and } 0.33.$$

0.33.

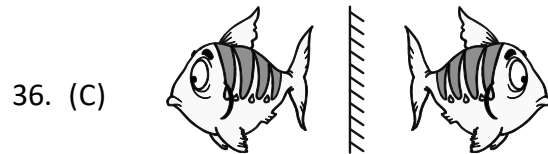
$$\frac{8}{15} = 0.53 \text{ doesn't lie between } 0.25 \text{ and } 0.33$$

$$\frac{5}{18} = 0.27 \text{ lie between } 0.25 \text{ and } 0.33.$$

34. (A, B, C) A parallelogram has no line symmetry

35. (A, B, D) Option (A) is true of SAS congruency.
 Option (B) is true for ASA congruency.
 Option (D) is true because SAS congruency.

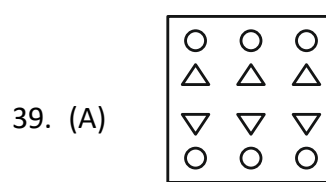
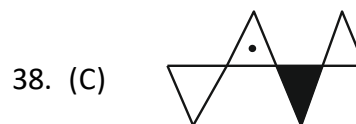
REASONING



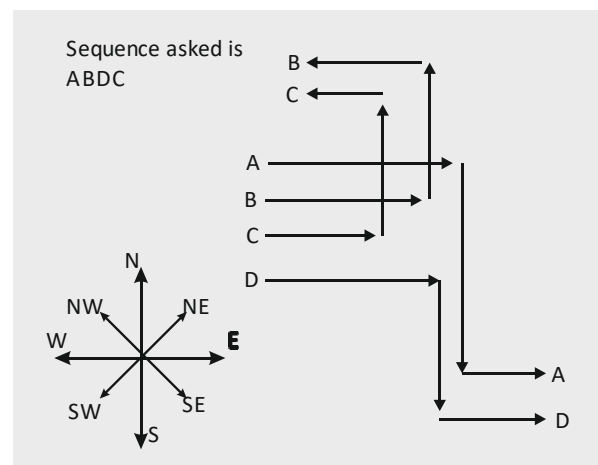
37. (C) $6^3 = 216$

$$15^2 = 225$$

$$216 = 225$$



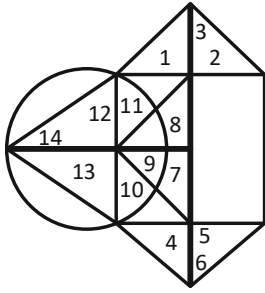
40. (B) East, West, West, East



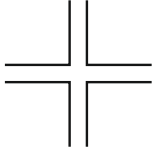
41. (C) Except is option (C) remaining options two letters are missing between in the letter series.

42. (D) First letter represent black circle and second letter represent white circles.

43. (C)



44. (A)



45. (C) Dictionary order is 2, 1, 4, 5, 3

CRITICAL THINKING

46. (B) Hence, number of people having one bicycle and 3 bicycle are equal. So, 29 families could be divided as

$$29 = 10 + 10 + 9$$

$$29 = 14 + 14 + 1$$

Or other groups as well as

Taking one group for example

$$10 \times 3 + 10 \times 1 + 9 \times 2$$

$$30 + 10 + 18 = 58$$

(OR)

$$14 \times 3 + 14 \times 1 + 1 \times 2$$

$$42 + 14 + 2 = 58$$

it is also possible with their pair.

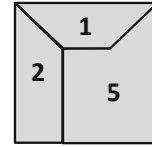
Hence, 58 is the answer in each case.

47. (B)

Since in the past the result was declared late by university. It has decided to conduct the examination in March/April in order to announce the result at proper times.

48. (B)

Figures 1, 2 and 5 will form the square as shown in the following image;



49. (A)

The given statements are as follows :

Student A : D tore the book.

Student B : It was not me.

Student C : It was not E.

Student D : A is lying.

Student E : B is telling the truth

Let say A is saying the truth. Then, statement of B, C and E are also true which can't be possible as only three statements are true.

Let say B, D and E are telling the truth, this implies that E has torn the book.

50. (B)

Wheel B moves anti-clockwise and slower than speed P (rotation per second).

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The End
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