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UNIFIED COUNCIL OLYMPIADS

UIMO
Unified International Mathematics Olympiad

UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD

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	C
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 $x = 0, y = 0$

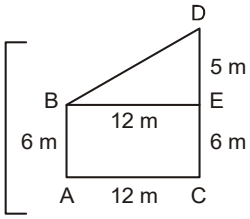
Hence only 2 integer pairs satisfy the condition $x + y = xy$

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 ΔBED,

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

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

$= 144 + 25 = 169$

$\therefore$ BD = 13 m

$\therefore$ Answer is option (C).

5. (C) Distance covered in 1 revolution =

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

$2\pi R = 8$

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

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

$\therefore$ Diameter = 2R = (2 × 14) m = 28 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 $\angle DOB = 3x$

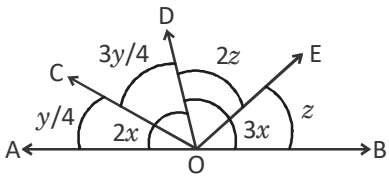
$\Rightarrow \angle DOG + \angle EOB = 3x$

$2z + z = 3x$

$3z = 3x$

$\therefore \quad z = x$

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



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

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

$\therefore$ Cost of $3\frac{3}{4}$ litres

$$= \frac{₹\cancel{5157}^{191}}{4} \times \frac{1}{\cancel{27}} \times \frac{15}{4} = \frac{₹2865}{16} = ₹179\frac{1}{16}$$

10. (B)

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

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

Mode = 27

Mean – 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 $4x - 7 = 2x + 5$

$2x = 12$

$x = 6$

$\therefore$ $2x + 5 = 2(6) + 5 = 12 + 5 = 17$ cm

14. (D) Given $x + 3x = 90°$

$4x = 90°$

$$x = \frac{90°}{4} = 22.5$$

$3x = 67.5°$

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.

$\therefore$ Each of its angles is 60°

$\therefore$ $x = 60° + 60° = 120°$

In ΔPRS, PR = RS

$\Rightarrow x + y + y = 180°$

$120° + 2y = 180°$

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

17. (B) Required simplified value

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

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

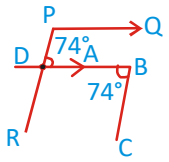
$$= \left(\frac{10ab + 9ab}{15}\right) + \left(\frac{-10bc - 21bc}{14}\right) + \left(\frac{-4ac + 15ac}{6}\right)$$

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

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||BC $\Rightarrow \angle B = \angle BDP = 74°$



[$\because$ Alternative angles]

Given AB||PQ

i.e., DB||PQ $\Rightarrow \angle BDP + \angle P = 180°$

$74 + \angle P = 180°$

$\angle P = 180° - 74° = 106°$

20. (C) In ΔABC, $\angle A + \angle B + \angle C = 180°$

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

$6\angle C = 180°$

$$\angle C = \frac{180°}{6} = 30°$$

$\therefore$ $\angle A = 3\angle C = 90°$

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

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

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

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

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

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

$$x = \frac{\cancel{27}^{3}}{125} \times \frac{49}{\cancel{9}_{1}}$$

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

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

$\therefore$ $\angle D = x = 47°$

In ΔACD, $y + x + 108° = 180°$

$y + 47° + 108° = 180°$

$y = 180° - 155° = 25°$

25. (B) $2^{3^{64}} = 2^{3^{2\times32}} = 2^{(3^2)^{32}} = 2^{9^{32}}$

26. (B) Let the first part be ₹ x

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

Given 10% ₹ x = 5% of ₹ $(45,000 - x)$

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

$2x + x =$ ₹ 45000

$3x =$ ₹ 45000

$$x = \frac{₹45000}{3} = ₹15,000$$

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

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

Given $y = 3x$

But $x + y = 180°$

$x + 3x = 180°$

$4x = 180°$

$$x = \frac{180°}{4} = 45°$$

$y = 3x = 3 \times 45° = 135°$

28. (C) Given CD||AB $\Rightarrow \angle DCE = \angle B = 60°$

In ΔABC, $55° + 60° + \angle ACB = 180°$

$\angle ACB = 180° - 115° = 65°$

29. (D) Sum of other two angles

$= 180° - 73° = 107°$

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

$$\therefore -\frac{5}{6} = \frac{-20}{24}, -\frac{3}{4} = -\frac{18}{24}, -\frac{2}{3} = -\frac{16}{24}, -\frac{17}{12} = -\frac{14}{24}$$

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

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 twoangles $=180-x$

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

$5x = 180^\circ - x$

$5x + x = 180^\circ$

$6x = 180^\circ$

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

Required angles of a triangle are 30°, 45°, 105° ; 30°, 65°, 85° ; 30°, 50°, 100°

32. (A, B, C, D)

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

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

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

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) $\frac{1}{3}=0.33, \frac{1}{4}=0.25$

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

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

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

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

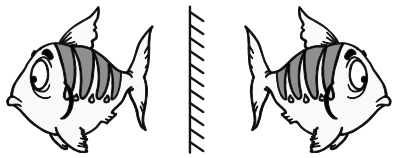
34. (A, B, C) A parallelogram has no line symmetry

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.

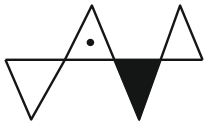
REASONING

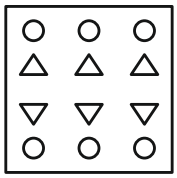
36. (C) 

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

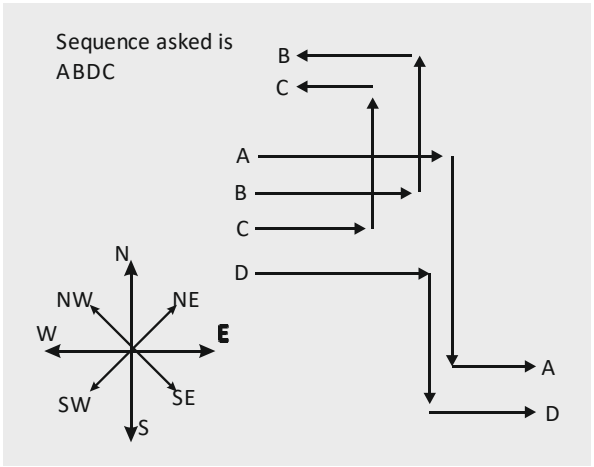
$15^2 = 225$

$216 = 225$

38. (C) 

39. (A) 

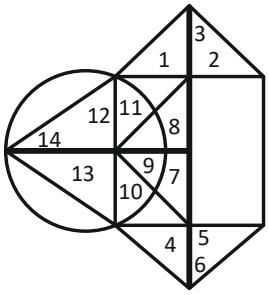
40. (C) East, West, East, West



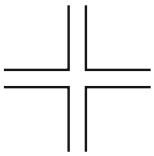
41. (C) Except is option (C) remaining options two letters are missing between in the letter series.

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 × 3 + 10 × 1 + 9 × 2

30 + 10 + 18 = 58

(OR)

14 × 3 + 14 × 1 + 1 × 2

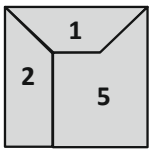
42 + 14 + 2 = 58

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).

The End