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UIMO
Unified International Mathematics Olympiad

UNIFIED INTERNATIONAL MATHEMATICS OLYMPIAD (UPDATED)

CLASS - 8

Question Paper Code : UM9279

KEY

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

EXPLANATIONS

MATHEMATICS - 1

1. (C) $1.32y + 0.02y - y = 0.595$

$0.34y = 0.595$

$$y = \frac{0.595}{0.34} = \frac{\cancel{59.5}^{3.5}}{\cancel{34}_{2}} = \frac{3.5}{2} \times \frac{2}{2} = \frac{7}{4}$$

2. (D) Let the number of people be 'x'

$\therefore$ Each person contribution = ₹x

$\therefore$ Total amount = (`x)(x) = ₹x^2

Given ₹x^2 = ₹2209

$$x^{\cancel{2}} = (47)^{\cancel{2}}$$

Number of persons in the group (x) = 47

3. (A) Given solid is a triangular prism

4. (B) Volume of the box = $(2.6\text{ m})^3 = 17.576\text{ m}^3$

5. (C) $$\left[\frac{1}{x-2} - \frac{4}{x^2-4}\right] = \frac{x+2-4}{(x^2-4)}$$

$$= \frac{\cancel{(x-2)}^{1}}{\cancel{(x-2)}_{(x+2)}} = \frac{1}{(x+2)}$$

6. (D) Required difference

$$= ₹1000\left(1+\frac{1\cancel{0}}{10\cancel{0}}\right)^4$$

$$- ₹1000 - \frac{₹1000\times 4\times 10}{100}$$

$$= ₹1\cancel{000}\times\frac{14641}{10,\cancel{000}} - ₹1000 - ₹400$$

= 1464.1 – 1400

= ₹ 64.1

7. (C) Excluded number = 29 × 5 – 27 × 4

= 145 – 108

= 37

8. (B) $(x^2 + y^2 - xy)(x^3 + y^2 + xy)$

$= (x^2 + y^2)^2 - (xy)^2$

$= x^4 + 2x^2y^2 + y^4 - x^2y^2$

$= x^4 + x^2y^2 + y^4$

9. (B) Cost of each piece $= \frac{₹112.50}{3} = ₹37.50$

$\therefore$ Number of pieces for

$$₹487.50 = \frac{₹487.50}{₹37.5} = 13$$

10. (D) Given $\frac{P\times\cancel{2}\times r}{\cancel{100}_{50}} = ₹400$

$\therefore$ Pr = 50 × ₹400 = ₹20000

Given

$$P\left(1+\frac{r}{100}\right)^2 - P - \frac{P\times r\times 2}{100} = ₹410 - ₹400$$

$$\Rightarrow P\left(1+\frac{2r}{100}+\frac{r^2}{10000}\right) - P - \frac{2Pr}{100} = ₹10$$

$$\Rightarrow \cancel{P} + \frac{2Pr}{\cancel{100}} + \frac{Pr^2}{10000} - \cancel{P} - \frac{2Pr}{\cancel{100}} = ₹10$$

$$\therefore \frac{Pr\times r}{10000} = ₹10$$

$$\frac{\cancel{20,000}^{2}\times r}{\cancel{10,000}} = 10$$

$$\therefore r = \frac{10}{2} = 5\%$$

11. (B) Given $2\sqrt{x} = 2 + \sqrt{12} = 2 + 2\sqrt{3}$

Cubing on both sides

$$\sqrt{x} = \frac{\cancel{2}(1+\sqrt{3})}{\cancel{2}}$$

Squaring on both sides

$$x = (1+\sqrt{3})^2$$

$$= 1 + 3 + 2\sqrt{3}$$

$$= 4 + 2\sqrt{3}$$

12. (A) $x^2 - y^2 = \left(\sqrt{2}\right)^2 - \left(\frac{1}{\sqrt{2}}\right)^2$

$$= 2 - \frac{1}{2} = \frac{4-1}{2} = \frac{3}{2}$$

13. (C) Speed per minute $(S_1) = \frac{37\text{km}}{50}$

$\therefore$ Total distance = Distance travelled for 6 hours

$$= \frac{37\text{km}}{50\text{min}}\times 360\text{min}$$

$$= \frac{1332}{5}\text{km}$$

Speed per minute

$$(S_2) = \frac{60\text{km}}{1\frac{1}{4}\text{h}} = \frac{60\text{km}}{\frac{5}{4}\text{h}}$$

$$= \frac{\cancel{48}^{4}\text{ km}}{\cancel{60}_{5}\text{ min}}$$

$\therefore$ Time taken to cover $\frac{1332\text{km}}{5} = \frac{d}{S_2}$

$$= \frac{\left(\frac{1332}{5}\text{km}\right)}{\left(\frac{4\text{km}}{5\text{min}}\right)}$$

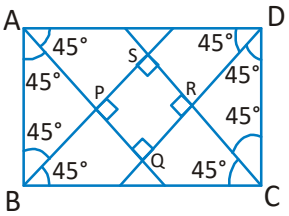
$$= \frac{\cancel{1332}^{333}}{\cancel{5}} \times \frac{\cancel{5}}{\cancel{4}}\text{min}$$

= 5 hours 33 minutes

14. (Delete)

15. (C) Given $y > x \Rightarrow \frac{1}{y} < \frac{1}{x}$

16. (C)



In ΔABP, $45° + 45° + \angle P = 180°$

$\Rightarrow \angle P = 90°$

Similarly $\angle Q = \angle R = \angle S = 90°$

In a quadrilateral PQRS, PS = PQ

$\therefore$ PQRS is a square

17. (A) 5 units difference = 15 cell phone

$$\therefore 1\text{unit} = \frac{\cancel{15}^{3}}{5} = 3$$

$\therefore$ No. of cell phones sold on Monday = 7 × 3 = 21

18. (D) Given A : B = 2 : 3 & B : C = 5 : 8

$\therefore$ A : B : C = 2 × 5 : 3 × 5 : 8 × 3 = 10 : 15 : 24

= $10x : 15x : 24x$

Given $10x + 15x + 24x = 98$

$49x = 98$

$$x = \frac{98}{49} = 2$$

C = $24x$ = 24 × 2 = 48

19. (B) Decreased percentage $= \frac{70 - 49}{70} \times 100$

$$= \frac{\cancel{21}^{3}}{\cancel{70}_{1\cancel{0}}} \times 10\cancel{0} = 30\%$$

20. (C) Area of rectangle = l × b

= $(x^3 + x^2y + xy^2 + y^3)\ (x - y)$ cm^2

$= x^3(x-y) + x^2y\,(x-y) + xy^2(x-y) + y^3\,(x-y)$

$= x^4 - \cancel{x^3y} + \cancel{x^3y} - \cancel{x^2y^2}$

$+ \cancel{x^2y^2} - \cancel{xy^3} + \cancel{xy^3} - y^4$

= $(x^4 - y^4)$ cm^2

21. (B) Given $3^{x-y} = 3^3 \Rightarrow x - y = 3 \rightarrow$ (1)

Given $3^{x+y} = 243 = 3^5$

$\Rightarrow x + y = 5 \rightarrow$ (2)

eg(2) – (1) $(x + y) - (x - y) = 5 - 3$

$\cancel{x} + y - \cancel{x} + y = 2$

$2y = 2$

$$y = \frac{\cancel{2}^{1}}{\cancel{2}} = 1$$

22. (C) $6p^2 + p - 12$

= 6p2 + 9p – 8p – 12

= 3p(2p + 3) – 4 (2p + 3)

= (3p – 4)(2p + 3)

23. (B) Length of rectangle

$$= \frac{\text{Area}}{\text{breadth}} = \frac{5\text{cm}^2}{\left(\frac{20}{13}\right)\text{cm}}$$

$$= \cancel{5}\ \text{cm}^2 \times \frac{13}{\cancel{20}_{4}\ \text{cm}}$$

$$= \frac{13}{4}\text{cm}$$

$$= 3\frac{1}{4}\text{cm}$$

24. (A) $4^2 + 7.5^2 = 16 + 56.25 = 72.25 = (8.5)^2$

$\therefore$ 4, 7.5 & 8.5 are pythagorean triplets

25. (C) Except option 'C' remaining are rational numbers

26. (D) Given $(2x-1)\times \cancel{4}\,x\,\text{cm}^2 = \cancel{60}^{15}\,\text{cm}^2$

$2x^2 - x - 15 = 0$

$2x^2 - 6x + 5x - 15 = 0$

$2x(x-3) + 5(x-3) = 0$

$(x-3)(2x+5) = 0$

$x-3=0 \quad (\text{or}) \quad 2x+5=0$

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

27. (B) Given l = 3 × 4 cm = 12 cm, b = 3 cm & h = 3 cm

$\therefore$ Total surface area = 2 (lb + bh + hl)

= 2 (12 × 3 + 3 × 3 + 3 × 12) cm^2

= 2 × 81 cm^2

= 162 cm^2

28. (A) Let the number of days be 'x'

No. of students	Charge	No. days
35	₹ 6300	24
25	₹ 3375	x

No. of students & no. of days are inversely proportional and charge is directly proportional to no. of days

$\therefore \cancel{25}^{5} \times \cancel{6300}^{900^{36^4}} : \cancel{35}^{7} \times \cancel{3375}^{135^{15^3}} = 24 : x$

$\therefore 4:3 = 24:x$

$4x = 24\times 3 \Rightarrow x = \frac{72}{4} = 18\,\text{days}$

29. (C) Let the number be 'x'

Given $x\left(1+\frac{\cancel{15}^{3}}{\cancel{100}_{20}}\right) = 184$

$x\left(\frac{20+3}{20}\right) = 184$

$x = \cancel{184}^{8} \times \frac{20}{\cancel{23}_{1}} = 160$

$\therefore$ Required number (x) = 160

30. (D) Given $\sqrt{1+\frac{25}{144}} = 1+\frac{x}{12}$

$\sqrt{\frac{144+25}{144}} = 1+\frac{x}{12}$

$\sqrt{\frac{169}{144}} = 1+\frac{x}{12}$

$\frac{13}{12} = 1+\frac{x}{12}$

$\cancel{1}+\frac{1}{12} = \cancel{1}+\frac{x}{12}$

$\therefore \; x = 1$

MATHEMATICS - 2

31. (A, B, C, D)

Options A, B, C & D are true

32. (A, B, C, D)

$17^2 - 13^2 = 289 - 169 = 120$

$\therefore$ 120 + 1 = 121 = 11^2

120 + 49 = 169 = 13^2

120 + 76 = 196 = 14^2

120 + 24 = 144 = 12^2

33. (A, B, D)

Except 'C' remaining options are rational numbers

$\frac{-62}{0}$ is not defined which is not a rational number

34. (A, B, C)

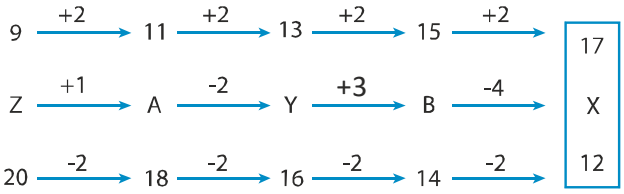
Given $x\,\alpha\,\frac{1}{y} \Rightarrow x_1y_1 = x_2y_2 = x_3y_3$

$\therefore$ 10 × 6 = 15 × 4 = 300 × 0.2 = 1200 × 0.05

35. (B, C) Only B & C options are true

REASONING

36. (B) Pattern of the series as shown below.



37. (A) Option A is the correct answer as the order in which the girls are sitting is Radha, Revati, Janhvi, Harshada, Nellima.

38. (B) May 20th, 2020 is wednesday

May + June + July + Aug + Sept + Oct + Nov

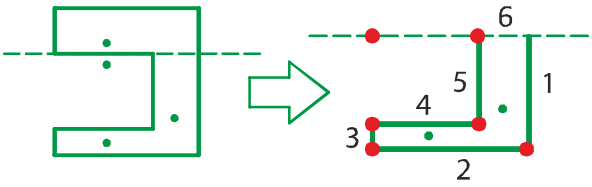
11 + 30 + 31 + 31 + 30 + 31 + 3 = 167 / 7 = 23

6 odd days from wed, tuesday is the 3rd nov, 2020

39. (D) 

40. (C) Overlaping first two images we get third image.

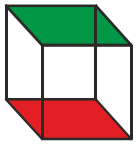
41. (C) In these type of questions, a common mistake is to miss or double count a particular side or corner. The best way to avoid this mistake is to keep marking the side/corner which has been counted.



After Cutting

42. (B) In any cube, for any of its sides, 4 sides will always be adjacent and one side will always be opposite to it. For example in the green coloured side of the cube below, only the side coloured red is opposite to it and all others are adjacent to it.

If all numbers adjacent to 5 are less then 5, then 1, 2, 3 and 4 are adjacent to 5. So 5 and 6 are opposite faces.



43. (C) 'G' is coded as '÷'

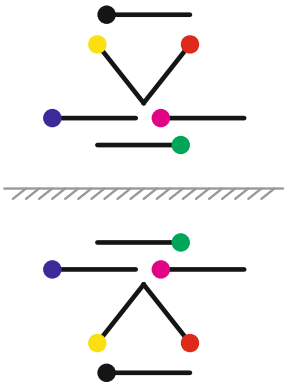
'R' is coded as '*'

'A' is coded as '@'

'P' is coded as '?'

'E' is coded as '×'

'S' is coded as '%'

44. (C) 

45. (A) Smallest triangles = ΔAOD, ΔAOE, ΔCOE, ΔBOD, ΔBOC=5

Triangles formed with two triangles

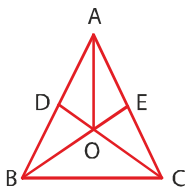
= ΔAOC (ΔAOE + ΔCOE), ΔAOB (ΔAOD + ΔBOD), BCD (ΔBOD + ΔBOC), ΔBCE (ΔBOC + ΔCOE) = 4

Triangles formed with three triangles

= ΔACD (ΔAOD + ΔAOE + ΔCOE), ΔABE (ΔBOD + ΔAOD + ΔAOE) = 2

Largest triangle = ΔABC = 1

Total triangles = 5 + 4 + 2 + 1 = 12



CRITICAL THINKING

46. (C) 

47. (A) Statement 1 : 9th floor have wall to wall carpeting.

Statement 2 : No wall to wall carpeting is pink.

So, None of offices on the 9th floor has pink wall to wall carpeting.

Hence, 3rd statement is true.

48. (B) Chaitan is heavier than Charan

(A) Kiran is as heavy as Lalith (partially true)

(B) Chaitan is heavier than Charan (true)

(C) Kiran is not heavier than Lalith (partially true)

(D) Kiran is as heavy as Chaitan and Lalith (false)

49. (C) 

50. (C) C