UNIFIED COUNCIL

An ISO 9001: 2008 Certified Organisation

UCO Unified Cyber Olympiad

UNIFIED CYBER OLYMPIAD - UC 329

Solutions for class : 9

Mental Ability

1. **(A)** Ratio of areas of adjacent faces of rectangular block = 900 cm^2

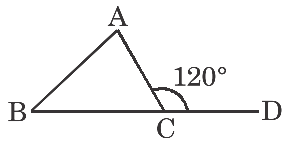
$l b.bh.hl = 900 \Rightarrow (lbh)^2 = 900$

$\therefore\ l.b.h = \sqrt{900} \Rightarrow lbh = 30$

$\therefore$ volume = 30 cm^3.

2. **(D)** In Δ ABC, $\angle ACD = 120°$

Side BC produced to D.



Let $\angle CAB = x°$

$\angle ABC = \frac{2}{3}\angle CAB$ (given)

$\angle ABC = \frac{2}{3}x$

$\angle CAB + \angle ABC = \angle ACD$

[$\because$ an exterior angle of a triangle = sum of its two interior opposite angles]

$x + \frac{2}{3}x = 120°$

$\frac{3x + 2x}{3} = 120°$

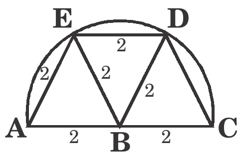
$\frac{5x}{3} = 120° \Rightarrow x = 120 \times \frac{3}{5} = 72°$

Hence $\angle BAC = 72°$

3. **(D)** We know if a + b + c = 0 then $a^3 + b^3 + c^3 = 3abc$

$\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{a^3 + b^3 + c^3}{abc} = \frac{3\cancel{abc}}{\cancel{abc}} = 3$

4. **(D)** The 3 equilateral triangles which are inscribed in a semi-circle are Δ ABE, Δ BDE and Δ BCD



Here each side = 2 cm

One triangle area = $\frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4}(2)^2$

$= \frac{\sqrt{3}}{\cancel{4}} \times \cancel{4} = \sqrt{3}\ cm^2$

Total three triangles area $= 3 \times \sqrt{3}$

$= 3\sqrt{3}\ cm^2$

5. **(C)** CD || EF || l_1

Now, $\angle x\ (180° - 130°) + (180° - 132°)$

$= 50° + 48° + 98°$

$\therefore\ \angle y\ (180° - 130°) + 30°$

$= 50° + 30° + 80°$

6. **(A)** We know that,

$\angle BOC = 90° + \frac{1}{2}\angle A$

and $\angle BO'C = 90° + \frac{1}{2}\angle A$

$\Rightarrow \angle BOC - \angle BO'C = \angle A$

$\therefore \angle BOC = \angle BO'C + \angle A$

7. **(D)** Let $f(x) = px^3 + x^2 - 2x - q$

When f(x) is divisible by $(x - 1)$ then

$f(1) = 0 \Rightarrow p(1)^3 + (1)^2 - 2(1) - q = 0$

$\Rightarrow p + 1 - 2 - q = 0$

$\Rightarrow p - q = 1$ .... (1)

When f(x) is divisible by $(x + 1)$ then

$f(-1) = 0 \Rightarrow p(-1)^3 + (-1)^2 - 2(-1) - q = 0$

$\Rightarrow -p + 1 + 2 - q = 0$

$\Rightarrow p + q = 3$ .... (2)

(1) + (2) $\Rightarrow p - \cancel{q} + p + \cancel{q} = 1 + 3$

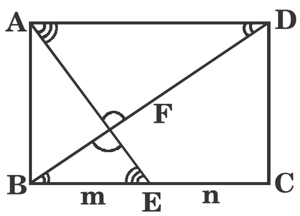
$\Rightarrow 2p = 4 \Rightarrow p = 2$ in (2)

(2) $\Rightarrow 2 + q = 3 \Rightarrow q = 3 - 2 = 1$

Hence $(p, q) = (2, 1)$

8. **(D)**

ΔFEB	ΔFAD	
$\angle BFE =$	$\angle DFA$	($\because$ Vertically opposite angles)
$\angle FBE =$	$\angle FDA$	($\because$ Interior alternate angles)
$\angle BEF =$	$\angle DAF$	($\because$ Interior alternate angles)



$\therefore \Delta FEB \sim \Delta FAD$ (by AAA-similarity)

When two triangles are similar then the ratio of areas of two triangles is equal to the ratio of squares of any two corresponding sides.

Hence $\dfrac{area(\Delta FEB)}{area(\Delta FAD)} = \dfrac{BE^2}{DA^2} = \dfrac{FB^2}{FD^2} = \dfrac{FE^2}{FA^2}$

From the data given in question and by seeing figure, we can say

BE = m and DA = (m + n)

$\therefore \dfrac{area(\Delta FEB)}{area(\Delta FAD)} = \dfrac{BE^2}{DA^2} = \dfrac{m^2}{(m+n)^2}$

9. **(C)** General form of the line parallel to Y-axis and K units away from it is $\boxed{x = K}$ Here given K = 5 units

$\therefore$ Required equation $\boxed{x = 5}$

10. **(D)** Linear expression divided by $(1 + a + a^5)$ and $(1 + a^4 + a^5)$ individually only if the highest power of a is 10 (i.e. 5 + 5) and 9 (i.e. 5 + 4) both are positive. Clearly, in options (A) and (C), the highest power of a is a 8. So, these options are not correct. Now, we have option (D) in which both a^{10} and a^9 are positive.

11. **(D)** Let a, b, c be the sides of the triangle

Given perimeter = 42 cm

$\Rightarrow a + b + c = 42$ cm

$\Rightarrow 18 + 10 + c = 42$

(Given a = 18 cm and b = 10 cm)

$\Rightarrow c = 42 - 28 = 14$ cm

Now area $= \sqrt{s(s-a)(s-b)(s-c)}$

$\left[s = \dfrac{a+b+c}{2} = \dfrac{18+10+14}{2} = 21\right]$

$= \sqrt{21(21-18)(21-10)(21-14)}$

$= \sqrt{21 \times 3 \times 11 \times 7}$

$= \sqrt{7 \times 3 \times 11 \times 7}$

$= 7 \times 3 \times \sqrt{11}$

$= 21\sqrt{11}\ \text{cm}^2$

12. **(B)** $\dfrac{x^2}{\sqrt{x^2+y^2}+y}$

RF of $\sqrt{x^2+y^2} + y$ is $\sqrt{x^2+y^2} - y$

Multiply and divide by RF

$= \dfrac{x^2}{\left(\sqrt{x^2+y^2}+y\right)} \times \dfrac{\left(\sqrt{x^2+y^2}-y\right)}{\left(\sqrt{x^2+y^2}-y\right)}$

$= \dfrac{x^2\left(\sqrt{x^2+y^2}-y\right)}{\left(\sqrt{x^2+y^2}\right)^2 - (y)^2}$

$= \dfrac{x^2\left(\sqrt{x^2+y^2}-y\right)}{x^2 + \cancel{y^2} + \cancel{y^2}}$

$= \dfrac{\cancel{x^2}\left(\sqrt{x^2+y^2}-y\right)}{\cancel{x^2}}$

$= \sqrt{x^2+y^2} - y$

13. **(B)** On X-axis each small division = $\frac{1}{6}$ units

On Y-axis each division = 1 unit

$\therefore$ point 'M' X-co ordinate = $18 \times -\frac{1}{6} = -3$

point 'M' Y-co ordinate = $1.5 = \frac{3}{2}$

Hence point 'M' = $\left(-3, \frac{3}{2}\right)$

14. **(A)** $x^2 + 4y^2 + 4y - 4xy - 2x - 8$

$(x^2 + 4y^2 - 4xy) - 2x + 4y - 8$

$(x - 2y)^2 - 2(x - 2y) - 8$

Let $x - 2y = k$

$k^2 - 2k - 8$

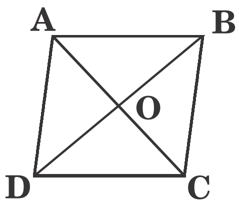
$k^2 - 4k + 2k - 8$

$k(k - 4) + 2(k - 4)$

$(k - 4)(k + 2)$

$(x - 2y - 4)(x - 2y + 2)$

15. **(A)** Since, ABCD is a rhombus, so its all sided are equal.



Now, $BC = DC$

In ΔBDC,

$\angle BDC = \angle DBC = x^o$

Also, $\angle BCD = 60^o$ [given]

$\therefore$ $x + x + 60^o = 180^o$

$\Rightarrow$ $x = 60^o$

$\therefore$ $\angle BDC = \angle DBC = \angle BCD = 60^o$

So, ΔBDC, is an equilateral triangle.

$\therefore$ $BD = BC = a$

$AB^2 = OA^2 + OB^2$

[∵ diagonals of rhombus intersect each other at 90^o]

$\Rightarrow$ $OA^2 = AB^2 - OB^2$

$\Rightarrow$ $OA^2 = a^2 - \left(\frac{a}{2}\right)^2 = a^2 - \frac{a^2}{4} = \frac{3a^2}{4}$

$\therefore$ $OA = \frac{\sqrt{3}}{2}a$

Now, $AC = \left(2 \times \frac{\sqrt{3}}{2}a\right) = \sqrt{3}\ a$

$\therefore$ $AC : BD = \sqrt{3}\ a : a = \sqrt{3} : 1$

Reasoning

16. **(B)** First figure is vertically inverted to obtain the second figure. On following this pattern, we see that, option (B) will complete the second pair.

Hence, option (B) is correct.

17. **(A)** The stripes in small circles over large circles remain the same. The other elements in bigger circle i.e. star, dot and square are rotating in clockwise direction and the S written in small circle is rotating 90° in clockwise direction. On following this pattern, we see that option (A) will come next.

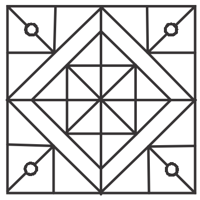
Hence, option (A) is correct.

18. **(D)** The figures (A), (B) and (C) have triangle upside down but option (D) does not follow this pattern.

So, option (D) is odd one out.

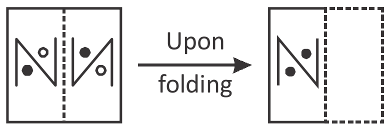
Hence, option (D) is correct.

19. **(D)** The grid can be completed as



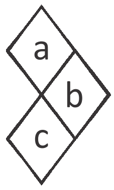
Hence, option (D) is correct.

20. **(C)** Upon folding, the transparent sheet will appear as



Hence, option (C) is correct.

21. **(C)** Consider the given figure as



Apply the logic, $\frac{a^2 + b^2}{10} = c$

From the first figure:

$\frac{(11)^2 + (13)^2}{10} = \frac{121 + 169}{10} = \frac{290}{10} = 29.$

From the second figure:

$\frac{(17)^2 + (19)^2}{10} = \frac{289 + 361}{10} = \frac{650}{10} = 65.$

In the same way, fromthe thrid figure:

$\frac{(23)^2 + (29)^2}{10} = \frac{529 + 841}{10} = 137.$

22. **(B)** When the given sheet (x) is folded, pairs of opposite faces are

Clearly, the cubes shown in figures (ii) and (iv) consist of faces which are not formed when the sheet (x) is folded. So, these two cubes cannot be formed. Only the cubes given in figures (i) and (iii) can be formed.

Hence, option (B) is correct.

23. **(C)** In each row the figure in the first column is divided into two parts in the second column and into four parts in the third column.

Hence, option (C) is correct.

24. **(B)** Here, the first figure of the first pair is laterally inverted to obtain the second figure as shown

Following the above pattern, we see that option (A) will complete the second pair as

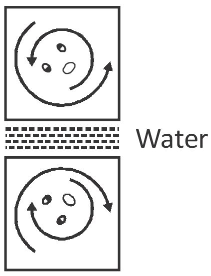
Hence, option (B) is correct.

25. **(B)** Figure (P) is same as figure (R). Similarly, figure (S) is same as figure (T) but figure (Q) is different.

So, figure (Q) is odd one out.

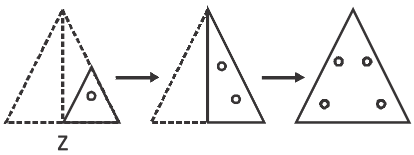
Hence, option (B) is correct.

26. **(C)** The water image can be obtained as



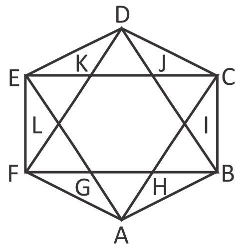
Hence, option (C) is correct.

27. **(C)** Upon unfolding the folded paper, represented by figure (Z), we get



Hence, option (C) is correct.

28. **(C)** On labelling the given figure, we get



Number of single triangles formed = Δ AGH, Δ AHB, Δ BHI, Δ BIC, Δ CIJ, Δ CJD, Δ DJK, Δ DKE, Δ EKL, Δ ELF, Δ FLG and Δ FGA= 12

Number of triangles formed by 2 small triangles = Δ AGB, Δ AIB, Δ BHC, Δ BJC, Δ CID, Δ CKD, Δ DJE, Δ DLE, Δ EKF, Δ EGF, Δ FLA and Δ FHA = 12

Number of triangles formed by 3 small triangles = Δ ABF, Δ ABC, Δ BCD, Δ CDE, Δ DEF and Δ AEF = 6

Other bigger triangles = Δ ACE and Δ BDF =2

∴ Total number of triangles

= 12 + 12 + 6 + 2 = 32 triangles

Hence, option (C) is correct.

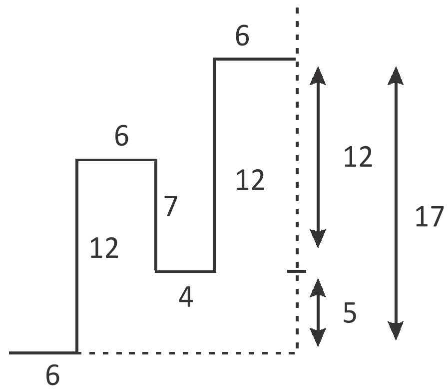
29. **(D)** Q x R = Q is the father of R.

R $ P = R is the brother of P.

P $ N = P is the brother of N.

Hence Q x R $ P $ N = P is the son of Q.

30. **(A)**



Computers

31.	**(C)**	32.	**(A)**	33.	**(C)**
34.	**(B)**	35.	**(D)**	36.	**(D)**
37.	**(B)**	38.	**(B)**	39.	**(B)**
40.	**(A)**	41.	**(C)**	42.	**(B)**
43.	**(B)**	44.	**(B)**	45.	**(D)**

English

46.	**(C)**	47.	**(D)**	48.	**(D)**
49.	**(B)**	50.	**(D)**		