SECTION - I

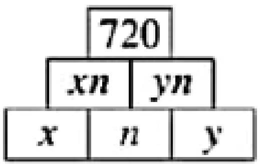
1. (C)
Let the votes cast for each candidate be 12, x, y, z and 4 with $12 > x > y > z > 4$.
Since there were 36 votes cast in total, we have $x + y + z = 20$.
Since $y > z > 4$, and x, y and z are integers, the minimum value of $y + z$ is 6 + 5 = 11 and hence the maximum value x can be is 9 with an overall solution for (x, y, z) in the that case being (9, 6, 5). Also, since 7 + 6 + 5 = 18 < 20, the minimum value x can take is 8 with an overall solution for (x, y, z) in that case being (8, 7, 5). Hence, although it is not possible to determine exactly how many votes the candidate in second place received, we do know they received either 8 or 9 votes.

2. (C)
Six extra trolleys added 60 cm to the length of the set.
Therefore, each extra trolley adds 60 cm ÷ 6 = 10 cm to the set.
Since a set of four trolleys has length 108 cm,
the length of a single trolley is (108 – 3 × 10) cm, or 78 cm.

3. (C)
Let the mass of a fresh mushroom be $20X$ grams. Since water makes up 80 per cent of this, the mass of water in the fresh mushroom is $16X$ grams and the mass of remainder is $4X$ grams. In a dried mushroom, water makes up only 20 per cent. Therefore, the $4X$ grams of the remainder is 80 per cent of the dried mushroom and hence the mass of water in the dried mushroom is X grams. Therefore, the percentage decrease in the mass of a fresh mushroom during drying is

$$\frac{20X-(4X+X)}{20X}\times 100=\frac{15X}{20X}\times 100=75$$

4. (D)
Let the integer in the left- and right-hand box of the bottom row be x and y respectively, as shown. Since each box in the second and third rows contain the product of the integers in the two boxes below them, the integers in the second row are xn and yn and the integer in the top row is xyn^2. The question tells us that this is to be equal to 720 and therefore n can be any integers such that it squares is a factor of 720.



When 720 is written as a product of its prime factors, we obtain $720 = 2^4 \times 3^2 \times 5$.
Therefore the possible values of n are 1, 2, 2^2, 3, 2 × 3 and $2^2 \times 3$.
Hence there are six possible values of n.

5. (D)
The total number of eggs in Farmers Fi's baskets initially is 4 + 6 + 12 + 13 + 22 + 29 = 86.
Once she sells one basket, she notices that the number of chicken eggs she has left is twice the number of duck eggs she has left. Therefore, the total number of eggs she has left is a multiple of 3. Hence the number of eggs that were bought by the first customer has the same remainder when divided by 3 as the original number of eggs. Since 86 = 3 × 28 + 2, that remainder is 2. Now 4, 13 and 22 all have a remainder of 1 when divided by 3 while both 6 and 12 are multiples of 3. However 29 = 3 × 9 + 2 and so has a remainder of 2 when divided by 3. Therefore the first customer bought 29 eggs.

6. (C)

Let Bob's speed be V km/h. Therefore Alex's speed is $3V$ km/h. Since they meet each other for the first time after 15 minutes, or $\frac{1}{4}$ of an hour, the total distance between P and Q, in km, is $\frac{1}{4}\times V+\frac{1}{4}\times 3V=V$. Let the distance Bob has travelled when Alex passes him for the second time be Y km. Since time $=\frac{\text{distance}}{\text{speed}}$, we have $\frac{Y}{V}=\frac{V+Y}{3V}$ and hence $3Y=V+Y$, which has solution $Y=\frac{V}{2}$.

Hence the time in hours that Bob has travelled when Alex passes him for the second time is $\frac{\frac{V}{2}}{V}=\frac{1}{2}$.

Therefore they will meet for a second time after 30 minutes.

Note: When Alex passes Bob for the second time, they are both travelling in the same direction towards P, whereas when he passed Bob for the first time they were travelling in opposite directions.

7. (D)

Let the size, in degrees, of angle QPR is x. Since triangle PSQ is isosceles, angle $PQS=x$ and, using the external angle theorem, angle $RST=2x$. Since triangle STR is isosceles, angle $STR=2x$ and, since angles in a triangle add to 180°, angle $TQR=(180-(180-2x))/2=x$. Therefore angle $PQR=x+x=2x$ and, since triangle PQR is also isosceles, angle $PRQ=2x$. Therefore, in triangle PQR, we have $x+2x+2x=180$, since angles in a triangle add to $180°$. Hence $x=36$ and so the size, in degrees, of angle QPR is 36.

8. (C)

Amount of work done by / man = x

Amount of work done by /woman = y

$(2x+3y)(10)$ = Total work

$(3x+2y)8$ = Total work

Equation total work in both each

$20x+30y=24x+16y$

$7y=2x$

Let 2 mean complete work in D Days

$(2x)D=\text{Total work}=(2x+3y)10$

$$2x\ D=\left(2x+3\left(\frac{2x}{x}\right)\right)=10$$

$$D=\left(1+\frac{3}{7}\right)^{10}=\frac{100}{7}\text{ Days}$$

9. (B)

Given, the interior angle is $165°$, we set up the equation:

$165=[(n-2)\times 180]/n$

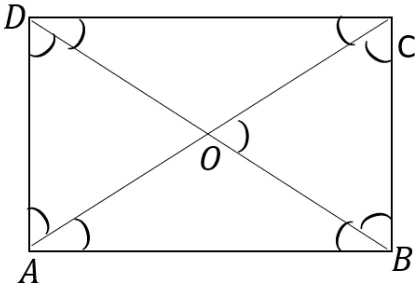
Multiple both sides by n : $165n=180(n-2)$

$\Rightarrow 165n=180n-360$

$\Rightarrow 180n-165n=360$

$\Rightarrow 15n = 360$
$\Rightarrow n = 24$
$\therefore$ The number of sides of the polygon is 24.

10. (C)



$\angle ADB = 50°$

11. (C)
Given:
Total amount planned to be spent = Rs. 96
4 student did not attend, and the remaining student contributed Rs. 4 extra.
Formula used:
Let the total number of students planned be *x*.
Initial contribution per student = Rs. 96/*x*
Final contribution per student = Rs. 96 / (*x* – 4)
Final contribution per student = Initial contribution per student + Rs. 4
Calculation:
$96/(x-4) = 96/x + 4$
$\Rightarrow 96x = 96(x-4) + 4x(x-4)$
$\Rightarrow 96x = 96x - 384 + 4x^2 - 16x$
$\Rightarrow 4x^2 - 16x - 384 = 0$
$\Rightarrow x^2 - 4x - 96 = 0$
Solving the quadratic equation :
$\Rightarrow x = [4+20]/2 = 12$ or $x = [4-20]/2 = -8$
(not possible)
Therefore, *x* = 12.
The number of students who attended the trip
= 12 – 4 = 8.
$\therefore$ The number of students who attended the trip was 8.

12. (A)
Let, $k^3 = x$
So, $8x^2 + 15x - 2 = 0$
$\Rightarrow 8x^2 + 16x - x - 2 = 0$
$\Rightarrow 8x(x+2) - 1(x+2) = 0$
$\Rightarrow (8x-1)(x+2) = 0$

$\Rightarrow\ 8x-1=0\ \Rightarrow\ x=\frac{1}{8}$

$\Rightarrow\ 8x+2=0\ \Rightarrow x=-2$ [Not possible because of negative4 value]

Now, $k^3=\frac{1}{8}$

$\Rightarrow\ k=\frac{1}{2}\ \Rightarrow\ \frac{1}{k}=2$

Then, $\left(k+\frac{1}{k}\right)=\left(\frac{1}{2}+2\right)=\frac{5}{2}=2\frac{1}{2}$

$\therefore$ The value of $\left(k+\frac{1}{k}\right)$ is $2\frac{1}{2}$.

13. (A)

14. (D)

$72x^3y^4z^4=2\times2\times2\times3\times3\times x\times x\times x\times y\times y\times y\times z\times z\times z\times z$.

$120z^2d^4x^4=2\times2\times2\times3\times5\times z\times z\times d\times d\times d\times d\times x\times x\times x\times x$

$96y^3z^4d^4=2\times2\times2\times2\times2\times3\times y\times y\times z\times z\times z\times d\times d\times d\times d$

The common factor is $24z^2$.

15. (D)

According to factor theorem, $x-a$ is a factor of $p(x)$ if $p(a)=0$.

Here, it is given that $x-3$ is a factor of $5x^3-2x^2+x+k$.

Therefore, $p(3)$ must be equal to zero.

$p(3)=5(3)^3-2(3)^2+3+k=0$

Therefore, $5(27)-2(9)+3+k=0$

$135-18+3+k=0$

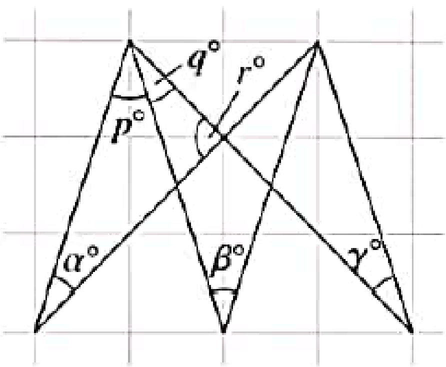
$120+k=0$

Therefore, $k=-120$

SECTION - II

16. (9)

Let the three unknown angles in the triangle indicated be $p°$, $q°$ and $r°$, as shown. Since the angle of size $r°$ is made up of two $45°$ angles, we have r = 90. Also, since the triangle with $p°$ at its vertex is congruent to the triangle with $\beta°$ at its vertex, we have $p=\beta$. Using alternate angles with a pair of parallel lines, we also have $q=\gamma$. Since the angles in a triangle add to $180°$, we have $\alpha+(p+q)+r=180$.



Therefore $\alpha+(\beta+\gamma)+90=180$. Hence $\frac{\alpha+\beta+\gamma}{10}=9$.

17. (8)

XYZ is a 3-digit number, with X, Y and Z distinct non-zero digits.

$XYZ - YXZ = 90$

Concept Used:

General Form of 3 digit number $XYZ = 100X + 10Y + Z$

Calculation:

$\Rightarrow XYZ = 100X + 10Y + Z$

$\Rightarrow YXZ = 100Y + 10X + Z$

Since, $XYZ - YXZ = 90$

$\Rightarrow (100X + 10Y + Z) - (100Y + 10X + Z) = 90$

$\Rightarrow 90(X - Y) = 90$

$\Rightarrow (X - Y) = 1 \Rightarrow X > Y$

But X can be maximum at 8, then possible values of (X, Y) are (9, 8), (8, 7), (7, 6), (6, 5), (5, 4), (4, 3), (3, 2), (2, 1)

Total possible values = 8