M. Prakash Academy Entrance Examination 2015

Standard IX

19^{th} April 2015. Solutions

Student's Name: Receipt Number:

Mathematics

Q1. Virat runs twice as fast as he walks. He travels from his house to school by walking some distance and by running some distance. On Monday his walking time is twice his running time and reaches the school in 30 minutes. On Tuesday his running time is twice his walking time. Find the time in minutes he takes to reach the school on Tuesday.

Solution: Virat's running speed is twice his walking speed. On Monday Virat walks for 20 minutes and runs for 10 minutes. Hence on Monday distance covered by walking equals distance covered by running.
This means that, if Virat had covered all the distance walking only he would take 40 minutes.(1)
On Tuesday his running time is twice his walking time. Hence distance covered by running is 4 times distance covered by walking.
Hence distance covered walking is $\frac{1}{5}$ the total distance.
By (1) Virat must have walked $40 \times \frac{1}{5} = 8$ minutes on Tuesday. Hence he must have run for 16 minutes on Tuesday. So total time taken on Tuesday is 24 minutes.

Q2. The fraction $\frac{35}{16}$ can be written in the form $\frac{35}{16} = 2 + \cfrac{1}{x + \cfrac{1}{y}}$ where x, y are natural numbers.

Find $(x+y)^2$.

Solution: $\frac{35}{16} = 2 + \frac{3}{16} = 2 + \frac{1}{\frac{16}{3}} = 2 + \frac{1}{5 + \frac{1}{3}}$. So, $x = 5, y = 3, (x+y)^2 = 64$

Q3. Let $n = 100^{25} - 25$. Let S denote the sum of the digits of n. Find the smallest natural number k such that $S + k$ is a perfect square.

Solution: 100^{25} means 1 followed by 50 zeroes.
$\therefore$ $n = 9999 \cdots 975$, where digit 9 occurs 48 times. Hence the sum of the digits of n namely $S = (48 \times 9) + 7 + 5 = 444$. The nearest square is 484. So, answer is 40.

Q4. If $1.236 \times 10^{15} - 5.23 \times 10^{14} = a.bc \times 10^k$ where a, b, c are digits from 1 to 9 and k is a natural number. Find $(a + b + c + k)$.

Solution: $1.236 \times 10^{15} - 5.23 \times 10^{14} = 12.36 \times 10^{14} - 5.23 \times 10^{14} =$
$(12.36 - 5.23) \times 10^{14} = 7.13 \times 10^{14}$. So, answer is $7 + 1 + 3 + 14 = 25$

Q5. Two adults have their birthday on the same day. On a particular birthday the product of their ages is 770. Find the sum of their ages on that birthday.

Solution: As each person is an adult ,we need to find two factors greater than or equal to 18. $770 = 11 \times 7 \times 5 \times 2 = 35 \times 22$. So, answer is $35 + 22 = 57$

Q6. Mohit bought a number of balls. He was required to pay 5% tax on his purchase. If he did not have to pay the tax he could have bought 3 more balls in the total amount he had spent. How many balls did Mohit buy?

Solution: One can assume that cost price of 1 ball is Rs. 100. Tax is 5%. Hence he pays Rs. 5 as tax per ball. As he could buy 3 balls from tax paid means he has paid $100 \times 3 = 300$ as tax. Hence he has bought $\frac{300}{5} = 60$ balls.

Q7. Two candles of length one feet each start burning at the same time. One of the candles

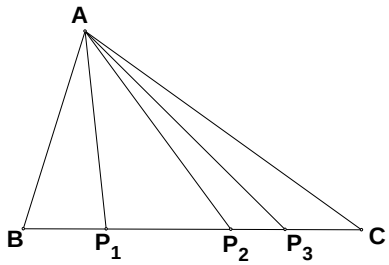
will burn down in 40 hours and the other in 24 hours. If after H hours one of the candle has length 3 times the length of the other candle, find H.

Solution: The candle which completely burns in 40 hrs. (say candle A) will burn $\frac{1}{40}$ feet in one hour.
Therefore in H hours candle A will burn $\frac{H}{40}$ feet. So, after H hours, $\left(1-\frac{H}{40}\right)$ feet of candle A remains.
Similarly,
The candle which completely burns in 24 hours (say candle B), will burn $\frac{1}{24}$ feet in one hour.
Therefore in H hours, candle B will burn $\frac{H}{24}$ feet. So, after H hours, $\left(1-\frac{H}{24}\right)$ feet of candle B remains.
As candle A burns slower than candle B, after H hours, candle A will be longer than candle B,
Therefore $1-\frac{H}{40}=3\left(1-\frac{H}{24}\right)$,
Solving, we get $H=20$.

Q8. 125 small cubes of size $1\times1\times1$ are put together to form a cube of size $5\times5\times5$. Two cubes of size $1\times1\times1$ are said to be neighbours if they are placed such that their one face of size 1×1 touches each other. Find the number of $1\times1\times1$ cubes having exactly four neighbours.
(Note that a cube has 8 vertices, 12 edges and 6 faces.)

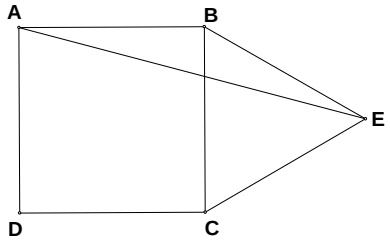
Solution: Observe that cubes having four neighbours are the ones along every edge, excluding the ones at the corner. So every edge has three such cubes. Total edges = 12, hence answer is 36.

Q9. In $\triangle ABC$, three points P_1, P_2, P_3 are placed on segment BC and each joined to vertex A. The resulting figure contains all together 10 triangles. Find the total number of triangles present in the figure if 12 points $P_1, P_2, ..., P_{11}, P_{12}$ are placed on segment BC and each is joined to vertex A.



Solution: Since vertex A is common to all triangles, let's write only the bases of the triangles. In the first case, let's see how we can methodically write all the bases. Each base has left end point and right end point. If the left point is B then the possible bases are BP_1, BP_2, BP_3, BC. So, there are four bases. If we take P_1 as the left point then possible bases are P_1P_2, P_1P_3, P_1C, i.e. there are three bases. With P_2 as left point we get P_2P_3, P_2C as two bases and with P_3 there is one base P_3C. Therefore there are $4+3+2+1=10$ possible bases hence 10 triangles.
In the given problem, with B as left point we have bases
$BP_1, BP_2, BP_3, \cdots, BP_{12}, BC$ giving 13 bases hence total number of triangles is $13+12+11+10+9+8+7+6+5+4+3+2+1=91$.

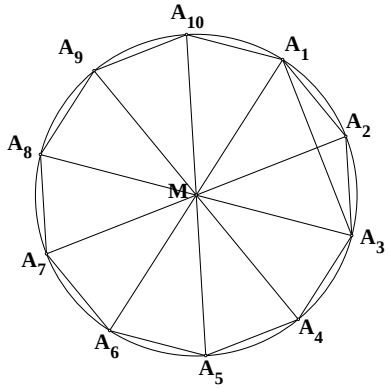
Q10. As shown in the figure $\square ABCD$ is a square and $\triangle EBC$ is an equilateral triangle. Find the measure of $\angle DAE$.



Solution: $m\angle ABE = 90^\circ + 60^\circ = 150^\circ$. In $\triangle ABE$, note that $AB = BE$. So, $m\angle BAE = \frac{1}{2}(180 - 150) = 15^\circ$. So, $m\angle DAE = 90^\circ - 15^\circ = 75^\circ$.

Q11.A polygon $A_1A_2A_3.....A_{10}$ of 10 sides is inscribed in a circle, that is all the vertices lie on the circumference of the same circle. All the 10 sides are of equal length. Let M be the center of the circle.

Find the measure of $\angle A_3A_1A_2$.

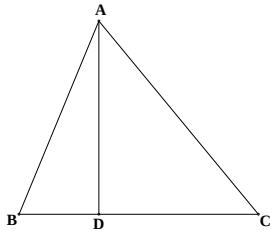


Solution: Note that each angle $\angle A_1MA_2, \angle A_2MA_3, \angle A_3MA_4, \cdots, \angle A_{10}MA_1$, has measure 36°.
In $\triangle A_1MA_2, MA_1 = MA_2$.
$\therefore m\angle MA_1A_2 = m\angle MA_2A_1$.
$\therefore m\angle MA_1A_2 = m\angle MA_2A_1 = \frac{1}{2}(180 - 36) = 72^\circ$.
Similarly in $\triangle MA_2A_3,\ m\angle MA_2A_3 = 72^\circ \therefore m\angle A_1A_2A_3 = 144^\circ$.
In $\triangle A_1A_2A_3, A_1A_2 = A_2A_3$. $\therefore m\angle A_3A_1A_2 = \frac{1}{2}(180 - 144) = 18^\circ$.

Q12. In $\triangle ABC$ D is on segment BC such that $BD = x$ and $DC = 2x$. M is the midpoint of segment AC. If area of $\triangle ABD$ is 26 units find the area of $\triangle BMA$.

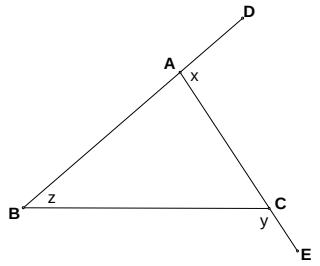
Solution: Let us say that the length of altitude from A on BC is h.
$\therefore \dfrac{Area(\triangle ABC)}{Area(\triangle ABD)} = \dfrac{\frac{1}{2}BC \times h}{\frac{1}{2}BD \times h} = \dfrac{BC}{BD} = 3.\ \therefore Area(\triangle ABC) = 78.$
Exactly by the same logic, $\dfrac{Area(\triangle ABC)}{Area(\triangle BMA)} = 2.\ \ \therefore Area(\triangle BMA) = 39.$

Q13. In $\triangle ABC$, D is the foot of the altitude from A on segment BC. If $AD = 24$, $AC = 30$ and $BC = 28$. Find AB.



Solution: In $\triangle ADC$, by Pyathagoras theorem
$DC^2 = AC^2 - AD^2 = 30^2 - 24^2 = 900 - 576 = 324 = 18^2$.

$\therefore BD = BC - DC = 10.$
In $\triangle ADB$, we get by Pyathagoras theorem
$AB^2 = AD^2 + DB^2 = 24^2 + 10^2 = 676 = 26^2 \quad \therefore AB = 26.$
Q14. As shown in the figure $m\angle DAC = x^\circ, m\angle BCE = y^\circ$ and $m\angle ABC = z^\circ$. Find $\frac{1}{12}(x + y - z)$.



Solution: Let A, B, C denote the measures of angles of $\triangle ABC$.
Note that $A = 180 - x$ and $C = 180 - y$. We have
$A + B + C = 180$
$\therefore (180 - x) + z + (180 - y) = 180$
$\therefore x + y - z = 180$
$\therefore \frac{1}{12}(x + y - z) = 15.$

Q15. I have a 14 digit interesting number. The sum of its any three consecutive digits is same. If its first digit is 4, its 5^{th} digit is 7 and the sum of its all digits is 79 then find the sum of its last 4 digits.

Solution: Let the first three digits be x, y, z. As the sum of three consecutive digits is same, the fourth digit must be x. It follows that the fifth digit must be y, sixth must be z and so on. Therefore the number must be $xyzxyzxyzxyzxy$. $\therefore x = 4, y = 7$. Sum of all digits$= 5x+5y+4z = 79$. This gives $z = 6$.

Q16. Let $n = (7584)^2+4(7584)(1208)+4(1208)^2$. Find the smallest value of the natural number m such that the product of m and n is a perfect cube.

Solution: Let $x = 7584$ and $y = 1208$. Hence n can be written as; $n = x^2 + 4xy + 4y^2 = (x + 2y)^2 = (7584 + 2(1208))^2 \therefore n = (10000)^2 = 2^8 5^8$. So, $m = 2 \times 5 = 10$.

Q17. Let m be the largest divisor of 72^3 other than itself. Let n be the largest divisor of 75^4 other than itself. If L.C.M. of m and $n = p^a q^b r^c$ where p, q, r are distinct prime numbers then find the value of $a + b + c$.
(Note that the largest divisor of 10^3 other than 10^3 is 500).

Solution: $72 = 2^3 3^2$. $\therefore 72^3 = (2^3 3^2)^3 = 2^9 3^6 \quad \therefore m = 2^8 3^6$.
Similarly, $75 = 5^2 3 \quad \therefore 75^4 = (5^2 3)^4 = 5^8 3^4 \quad \therefore n = 5^8 3^3$.
So, LCM of m and n is $2^8 3^6 5^8$. So, $a + b + c = 8 + 6 + 8 = 22$.

Q18. We define a new operation $*$ as given below.
$a * b = a^2 + b$. For example, $8 * 5 = 8^2 + 5 = 69$.
If n is a natural number and p is a prime number then find the smallest value of p satisfying $8 * p = n * 6$.

Soultion: We want $8 * p = n * 6 \therefore 64 + p = n^2 + 6 \therefore p = n^2 - 58$. So, n^2 must be greater than 58 and $n^2 - 58$ must be prime. Try $n = 8$, gives $n^2 - 58 = 8$ is composite. Try $n = 9$ gives $n^2 - 58 = 23$ which is a prime.

Q19. Find the value of $(2\sqrt{20} + 4\sqrt{8})(6\sqrt{2} - \sqrt{45})$.

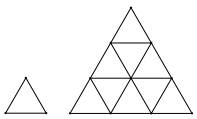
Solution: $\sqrt{20} = 2\sqrt{5}, \ \sqrt{8} = 2\sqrt{2}, \ \sqrt{45} = 3\sqrt{5}$
$\therefore (2\sqrt{20} + 4\sqrt{8})(6\sqrt{2} - \sqrt{45})$
$= (4\sqrt{5} + 8\sqrt{2})(6\sqrt{2} - 3\sqrt{5})$

$= 12(\sqrt{5} + 2\sqrt{2})(2\sqrt{2} - \sqrt{5})$
$= 12(2\sqrt{2} + \sqrt{5})(2\sqrt{2} - \sqrt{5})$
$= 12((2\sqrt{2})^2 - (\sqrt{5})^2)$
$= 12(8 - 5) = 36.$

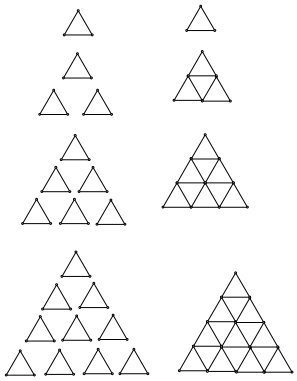
Q20. If $a^2 - b^2 = 132$ and $a + b = 22$ then find the value of $a + b^2$.

Solution: $a^2 - b^2 = (a + b)(a - b)$ substituting given value we get,
$a - b = 6 \quad \cdots(1).$
$a + b = 22 \cdots(2).$
Adding equation (1) and (2) we get $2a = 28$. This gives $a = 14$ and $b = 8$.
$\therefore a + b^2 = 14 + 64 = 78.$

Q21. As shown in the following figure equilateral triangle of size 1 is formed using 3 match sticks. To form an equilateral triangle of size 3 with all the equilateral triangle of size 1 inside it we require 18 match sticks. Find the total number of match sticks required to construct a size 6 equilateral triangle with all the equilteral triangle of size 1 inside it.



Solution: Observe the pattern:



So, the answer must be $3(1 + 2 + 3 + 4 + 5 + 6) = 63$

Q22. Consider the 8-digit number $3681m42n$ where m and n are digits from 0 to 9. Find the value of $m^2 + n$ if given 8-digit number is divisible by 72.

Solution: 72 is divisible by 8 and 9. So, the 8-digit number must be divisible by 8 and 9. So, $42n$ is divisible by 8 giving $n = 4$. Now, the sum of the digits must be divisible by 9 giving $m = 8$. So, $m^2 + n = 64 + 4 = 68$. **Q23.** Find the value of $100(1 - \frac{1}{8})(1 - \frac{1}{9})(1 - \frac{1}{10})\ldots\ldots\ldots(1 - \frac{1}{20})$.

Solution: Observe: $1 - \frac{1}{8} = \frac{7}{8},\ 1 - \frac{1}{9} = \frac{8}{9}, \ldots, 1 - \frac{1}{20} = \frac{19}{20}$
$\therefore\ 100(1 - \frac{1}{8})(1 - \frac{1}{9})(1 - \frac{1}{10})\ldots\ldots\ldots(1 - \frac{1}{20})$
$= 100\left(\frac{7}{8}\right)\left(\frac{8}{9}\right)\left(\frac{9}{10}\right)\ldots\left(\frac{18}{19}\right)\left(\frac{19}{20}\right) = 100\left(\frac{7}{20}\right) = 35.$

Q24. Integer k is 4^{th} power of another integer. If 18 is a factor of k then find the smallest value of $\frac{k}{18}$.

Solution: $18 = 2^1 \times 3^2$. So, the addional minimum factors in k to make it perfect 4^{th} power are $2^3 \times 3^2$. So, the smallest $k = 2^4 \times 3^4$ giving $k/18 = 2^3 \times 3^2 = 72$

Q25. Club G has several members. Average age of members of G increases by one year if either five members each 9 year old leave G or new five members each 17 year old join G. Find the

present number of members in G.

Solution: Suppose the present number of members is n and the average age is y years.
So, the present sum of the ages is ny.
When five members each 9 years old leave,
the number of members becomes $n-5$ and sum of ages becomes $ny-45$
giving $ny-45=(y+1)(n-5)$.
$\therefore ny-45=ny+n-5y-5$
$\therefore 5y-n=40\cdots(1)$
When five members each 17 years old join the group,
number of members becomes $n+5$ and sum of ages becomes $ny+85$
giving $ny+85=(n+5)(y+1)$
$\therefore ny+85=ny+5y+n+5$
$\therefore 5y+n=80\cdots(2)$
Adding equation (1) and (2) we get $10y=120$ giving $y=12$ and $n=20$ Hence the answer is 20.

Science

Q26. A merchant sells mangoes and apples in his shop. Selling price of one mango is $40Rs.$ and that of apple is $20Rs$. On one day, he has 100 fruits when he opens the shop. At end of the day he is left with 65 fruits and has collected $Rs.900$. **Find out number of apples sold and enter that number in your bubble sheet.**

Solution: Let the number of apples sold be a and the number of mangoes sold be m
Given:

- Total fruits sold are 100-65, i.e. 35
  $a+m=35$
- Money earned by selling fruits is 900 Rs.
  $20a+40m=900$

Solving these equations simultaneously to find the value of a, we get $a=25$
Number to be marked: **25**

Q27. . The Sun is extremely massive compared to the earth. It is 330000 times heavier than the earth i.e. 1 solar mass = 330000 earth mass. Mass of earth is $5.98\times10^{24}\ Kg$. Calculate the mass of the Sun. Express your answer as $A\times10^{B}\ Kg$, where A is less than 10 and B **is a natural number. Enter the value of B in your bubble sheet.**

Solution: Mass of the sun $=330000\times5.98\times10^{24}$
$=19.734\times10^{29}$
Thus, $B=29$
Number to be Marked: **29**

Q28. Following are the details of motion of an object over period of 1 minute. It is initially at point A. After 10 seconds, it starts moving with constant acceleration to the right and reaches point B in 20 seconds. It travels with constant speed for further 10 seconds to reach point D. It then decelerates until completion of 1 minute to stop at point E. Points A, B, C, D and E lie on a straight line.
During this motion, there is **some duration of time for which there is no net force acting on the object. Find this duration in seconds and enter that number in your bubble sheet.**

Solution: When there is no net force on the object, the acceleration on the object will be zero. Consequently, it will move with constant speed, or will be stationary.

- First 10 seconds (time 0-10 s): object is **stationary** at point A. Thus, Net force is **zero**
- Next 20 seconds (time 10-30 s): object is moving with constant acceleration. Net force is non-zero
- Next 10 seconds (time 30-40 s): object moves with **constant speed**. Net force is **zero**
- Final 20 seconds (time 40-60 s): objects moves with constant deceleration. Net force is non-zero

Net force is zero for 20 seconds from time t=0 to 10 and t=30 to 40 seconds
Number to be marked: **20**

Q29. Consider an object of mass 9 Kg in motion. Its initial velocity is 24 m/s and it slows down to a final velocity of 9 m/s in 3 seconds. Calculate the **net force acting on the object. Express your answer in Newton.**

Solution: Acceleration of the object is:
$a = \frac{v-u}{t}$
, where, v and u are the final and initial velocities of the object, and t is the time during which the object is in motion. Thus,
$a = \frac{9-24}{3}$
$a = a = -5\ m/s^2$
Force on the object is:
F =mass×acceleration
$F = 9 \times -5\ = -45\ N$
Number to be marked: **45**

Q30. Pressure is measured at three locations. Pressure A is measured at a point one meter below the surface of a small pond. Pressure B is measured at a point one meter below the surface of a huge lake. Pressure C is measured at a point one meter below the surface of a water tank. **Which of following statements is true? Enter the number of that statement in your bubble sheet.**

(11) $A > B > C$
(33) $C < A < B$
(55) $B < A < C$
(77) $C = A = B$

Solution: Pressure at a point depends on the **height** of the fluid column above that point. In all three cases, the height of water column above all points is 1m. Thus, pressure at all points is equal.
Number to be marked: **77**

Q31. A neutral plastic strip is rubbed with cotton. The strip acquires a positive charge. Following are some of the statement about the positively charged strip. **Some of the statements are true and some are false. Read these statements carefully and choose the correct option. Enter the number of that option in your bubble sheet.**

A. The strip lost some electrons to the cotton during the charging process.

B. The strip lost all of its electrons to the cotton during the charging process.

C. The strip has the opposite charge as that on the cotton.

D. The strip would now be repelled by the piece of cotton which was used to charge it.

E. The strip gained protons during the rubbing process.

F. As a material, plastic has a greater affinity for electrons than cotton.

G. The strip could exert either a repulsive or attractive influence upon neutral paper bits.

H. The strip has an excess of protons compared to the number of electrons.

I. The strip lost negative electrons and gained positive electrons during the charging process.

J. The strip lost neutrons during the charging process (or at the very least, its neutrons became ineffective).

Options

(11) Statements B, C, E and H are true.

(33) All statements are true and only statement I is false.

(55) Statements A, C and H are true and rest are false.

(77) A, C, E, G, H and J are true.

Solution: After rubbing the strip with cotton, some of the electrons on the surface of the strip are transferred onto the cotton. This makes the strip positively charged and the cotton negatively charged.

- A: **True**
- B: **False**. Some electrons are transferred to cotton, not **all**
- C: **True**. The strip is positively charged where as the cotton is negatively charged
- D: **False**. Opposites charges attract. Thus, the strip and cotton attract, and do not repel.
- E: **False**. The strip **lost electrons**.
- F: **False**. Cotton has a greater affinity for electrons, so electrons were transferred to cotton.
- G: **False**. A charged object **always attracts** neutral objects.
- H: **True**. As electrons are transferred to the cotton, so the strip has excess protons.
- I: **False**. The strip lost electrons but **did not gain protons**.
- J: **False**. Neutrons are not affected in any way in this process.

Thus, A, C, H are True, rest are False. Option 55 is correct.
Number to be marked: **55**

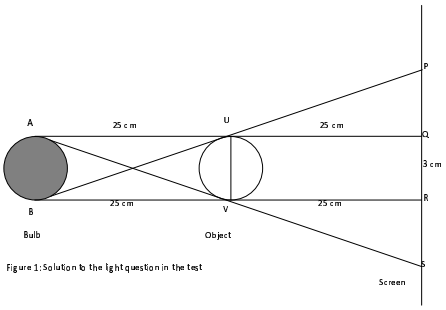


Figure 1: Solution to the light question in the test

Q32. A bulb of 3 *cm* diameter is 50 *cm* away from a screen. A ball with a diameter of 3 *cm* is held exactly halfway between the bulb and the screen. An umbra and a penumbra are formed on the screen. What will be the **diameter of the umbra region of the shadow? Express your answer in centimeter.**

Solution: The bulb, object and screen are placed as shown in the figure. The umbra region is marked between points Q and R, and is of length 3 *cm*.
Number to be marked: **03**

Q33. A flask contains liquefied mixture of four substances A, B, C and D having boiling points as shown in the table. This mixture is subjected to fractional distillation so that the constituents are separated one by one. **Which substance will be left behind in the flask after completion of the process? Write the number assigned to that substance (number from the third column.)**

Substance	Boiling Point (^0C)	Number assigned
A	-182	32
B	-35	34
C	-57	44
D	-196	28

Solution:Liquid with highest B.P. is left behind − B($BP : -35^0C$)

No assigned :**34**

Q34. To find the percentage of an element in a particular compound, the following steps are followed:

The % of an element in a compound = $\dfrac{\text{weight of the element}}{\text{molecular weight of compound}} \times 100$

[For example : Molecular weight of H_2O : 2× atomic weight of Hydrogen (1) + 1× atomic weight of oxygen (16) = 18.

Percentage of Hydrogen in water = $\frac{2}{18} \times 100 = 11.11\%$]

Now attempt the following problem.

Ammonium nitrate - NH_4NO_3 and Urea - $CO(NH_2)_2$ are two examples of fertilizers containing Nitrogen. **Find the percentage of Nitrogen in that fertiliser which is richer in Nitrogen percentage. Write the integer part of your answer in the bubble sheet.**

Solution: mol. wt. of $NH_4NO_3 : 14 + 4 + 14 + 48 = 80$

The % of N = $\dfrac{28 \text{ x } 100}{80} \times 100 \;\; = \;\; 35$

mol. wt. of $CO(NH_2)_2 : 12 + 16 + (14 + 2)X2 = 60$

The % of N = $\dfrac{28 \text{ x } 100}{60} \times 100 \;\; = \;\; 46$

Ans:46

Q35. Balance the following chemical equation **by replacing a, b, c, d and e with appropriate natural numbers.**

$aS + bHNO_3 \rightarrow cH_2SO_4 + dNO_2 \uparrow + eH_2O$

Write the sum of a, b, c, d and e in your bubble sheet.

Solution: $a = 1, b = 6, c = 1, d = 6, e = 2$

$a + b + c + d + e = 16$

Q36. Most abundant element in air reacts with lightest element present in nature at high pressure and low temperature, in the presence of iron as a catalyst. A pungent smelling gas is produced. **Find the molecular mass of this gas.**

Solution: Ans: Ammonia $NH_3 = 14 + 3 = 17$

Q37. Consider 60 gm sample of 12 Carat Gold. There is another sample, 90 gm of 18 Carat gold. These two samples are mixed together to create an impure alloy. **Find the percent purity of the new alloy.**

Given: 24 Carat = 100% pure gold.

Solution: 60gm 12 Carat 50% denotes- 30gms gold and 30gms other metal.

90gm 18 Carat 50% denotes- 67.5 gms gold and 22.5 gms other metal.

Mixture : total wt. of gold $30 + 67.5 = 97.5$

total wt. of other metals $30 + 22.5 = 52.5$

total wt. of alloy = 150 % purity = $\frac{97.5 \text{ x } 100}{150} = 65$

Ans : 65

Q38. Carbon has two isotopes, Carbon−12 and Carbon−14. **Find the sum of electrons, protons and neutrons present in ^{12}C and ^{14}C isotopes of carbon.**

Solution: $^{1}2C - (P + N + e) = 6 + 6 + 6 = 18$

$^{1}4C - (P + N + e) = (6 + 8 + 6) = 20$

Ans $18 + 20 = 38$

Q39. Following is a list of some substances:

Cotton, rayon, jute, nylon, wool, terylene, melamine, acrylic, bakelite, polythene, silk, PVC (polyvinyl chloride), polyester.

Find the total number of **natural fibers** in the list. Call it X.
Find the total number of **artificial fibers** in the list. Call it Y.
Find the total number of **plastics** in the list. Call it Z.

Find the value of $(X + Y - Z)$ and enter it in your bubble sheet.

Solution: $X(naturalfibres) : Cotton, jute, wool, silk - total = 4$

$Y(Syntheticfibres) : Rayon, nylon, terylene, acrylic, polyster - total = 5$

$Z(Plastics) : Melamine, bakelite, polythene, pvc - total = 4$

$Ans : X + Y - Z = 4 + 5 - 4 = 05$

Q40. Following is a list of some substances:

Common salt, naphthalene, limestone, potash alum, iodine, white phosphorous, camphor, sugar and ammonium chloride.

How many of these substances can be separated by the process of sublimation? Enter this number in your bubble sheet.

Solution: Sublimable substances $- Naphthalene, Iodine, Camphor, NH_4Cl, WhitePhoshorous - Total = 05$