

ANSWER KEYS & SOLUTIONS

- Q1. (a) True ,
(b) True , South scored 2 goals
(c) False North scored 1 goal
(d) False South won, North lost.
(e) True

Q2. $x^2 - y^2 = 11$, $(x-y)(x+y) = 11 \times 1$
 $x-y = 1, x+y = 11$

Add ① and ②

$$x-y+x+y = 1+11$$

$$2x = 12$$

$$x = 6$$

From ① $x-y=1, x=1+y$

$$y = x-1$$

$$y = 6-1 = 5.$$

Q3.

All the divisor of N:

$$N = 13^2 \times 29 = 13 \times 13 \times 29$$

Divisor = 13, 29

1, 13, 29, 377, 169, 4901

Q4

I=0, H=1, E=2, U=9, S=6

Q5. $2x^3 = y^4$, $2x^3 - y^4 = 0$

let $x=2$, $2(2)^3 = y^4$
 $2^4 = y^4$, $y=2$

$x, y = 2, 2$.

let $x=32$,

$$2(32)^3 = y^4$$

$$2(25)^3 = y^4$$

$$2 \times 2^{15} = y^4$$

$$2^{16} = y^4$$

$$2^{4 \times 4} = y^4 \Rightarrow (16)^4 = y^4$$

$$y=16$$

$x=32, y=16$.

Q6. We can start by observing the numbers greater than 2009.

All the numbers 2010 to 2019 can start from digit 1. Hence not applicable.
2020 can be rearranged to form the smaller number 2002.

2021 can start from digit 1.

The number 2022 can't be rearranged to form a smaller number.

Alternatively,

If a, b, c, d is a 4 Digit number and it can be arranged to a smaller number then

$$a \leq b \leq c \leq d$$

among the numbers greater than 2009 the closest number which satisfies their criteria is 2022.

Q7.

For

Monday: A1 $\rightarrow 1 = 2^0$

Tuesday: AY1 $(2) \rightarrow 2^1$

Wednesday: AYYA1 $(4) \rightarrow 2^2$

Thursday- AYYAYAAAY $(8) \rightarrow 2^3$

The number of Alphabets keeps increasing
as a power of 2 on Friday, he will
speak 16. Alphabets and on saturday
he will speak 32 Alphabets.

Friday: AYYAYAAAYAYYA YAAAY $- 16 - 2^4$

Saturday: AYYAYAAAYAYYA YAAAY

AYYA YAAAYAYYA YAAAY

$- (32) - 2^5.$

Q8. Let no. of philosophers is P and no. of mathematicians is M.

As, every seventh mathematician is a philosopher,

the number of mathematician-philosophers

$$= \frac{M}{7}$$

Also, as every ninth philosopher is a mathematician
the number of mathematician-philosophers = $\frac{P}{9}$

So the number of mathematician-philosophers

$$= \frac{M}{7} = \frac{P}{9}$$

$$\Rightarrow P > M$$

No. of philosopher is higher.

09. $\frac{3 \text{ digger} \times 3}{3} = \frac{6 \text{ digger} \times 5}{?}$

$$? = \frac{6 \times 5 \times 3}{3 \times 3} = 10 \text{ pits.}$$

010. $\frac{2}{73} = \frac{1}{60} + \frac{1}{219} + \frac{1}{292} + \frac{1}{x}$

$$\frac{2}{73} - \frac{1}{292} = \frac{1}{60} + \frac{1}{219} + \frac{1}{x}$$

$$\frac{8-1}{292} = \left[\frac{1}{60} + \frac{1}{219} \right] + \frac{1}{x}$$

$$\frac{7}{292} - \frac{1}{219} = \frac{1}{60} + \frac{1}{x}$$

$$\frac{7}{73 \times 4} - \frac{1}{219} = \frac{1}{60} + \frac{1}{x}$$

$$\frac{1}{73} \left[\frac{21-4}{12} \right] = \frac{1}{60} + \frac{1}{x}$$

$$\frac{17}{73 \times 12} - \frac{1}{60} = \frac{1}{x}$$

$$\frac{1020 - 73}{4380} = \frac{1}{x} \cdot \frac{1}{x} = \frac{947}{4380}$$

$$x = \frac{4380}{947}$$

011. Mickey Mouse, Minnie Mouse, Goofy and

pluto

① Minnie mouse ② Pluto ③ Mickey mouse ④ Goofy

If Goofy, gets up and then sits down
between Mickey mouse and Minnie mouse,

Then new order

① minnie mouse ② Goofy ③ Mickey mouse ④ Pluto

012. 11 tugriks = 14 Dinari,

22 rupees = 21 Dinars.

10 rupees = 3 Thalers.

5 krona = 2 Thalers.

10 krona = 4 Thalers.

13 krona = $\frac{26}{5}$ Thalers.

$$= \frac{26}{5} \times \frac{10}{3} \times \frac{21}{22} \times \frac{11}{14} \text{ tugriks.}$$

$$= 13 \frac{1}{2} \text{ tugriks.}$$

$$13 \frac{1}{2} \text{ tugriks.}$$

Q13. Speed of valentine = 50m/min.

his assumptions were,

1meter = 60 cm

1min = 100sec

But we know ; 1m = 100cm, 1min = 60sec

∴ Distance covered by valentine

$$= 50 \times 60 = 3000 \text{ cm.}$$

But actual distance = $\frac{3000}{100} = 30 \text{ m}$

Actual time = 1min 40sec = $1 + \frac{40}{60} = 5 \text{ min}$

∴ Distance covered

By valentine in $\frac{5}{3} \text{ min} = 30 \text{ meters.}$

∴ 1min = $\frac{30 \times 3}{5} = 18 \text{ meter.}$

Hence Valentine's real = 18m/min.

running speed

Q14.

Screws

Nuts or Bolts.

start of
the year

1 dollar/kg

1 dollar/kg

$$27^{\text{th}} \text{ Feb} \quad 1 \times \frac{150}{100} = \frac{3}{2} \text{ dollar/kg}$$

$$1 \times \frac{50}{100} = \frac{1}{2} \text{ dollar/kg}$$

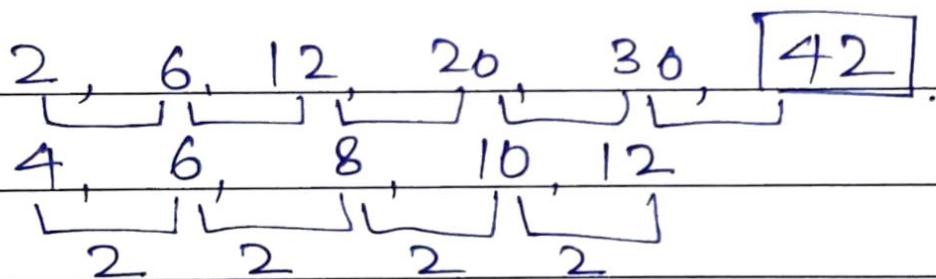
$$28^{\text{th}} \text{ Feb} \quad \frac{3}{2} \times \frac{50}{100} = \frac{3}{4} \text{ dollar/kg}$$

$$\frac{1}{2} \times \frac{50}{100} = \frac{1}{2} \times \frac{3}{2}$$

$$= \frac{3}{4} \text{ dollar/kg}$$

The price of both the product is same.

Q15.



Q16. Let the journey time be x hours.

For 6 hours talk time we get 210 hours.

of standby time.

Given that Alisha was talking on the phone for $\frac{x}{2}$ hours (half of journey)

for $\frac{x}{2}$ hours, her standby time = $\frac{x}{2} \times \frac{210}{6} = \frac{35}{2}$

Total number of hours:

$$\frac{x}{2} + \frac{35x}{2} = 18x$$

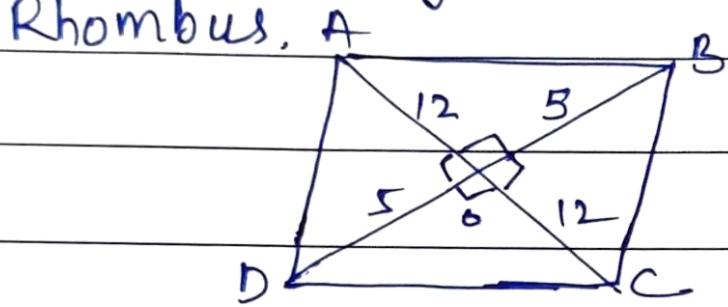
we know the battery drained;

she reached her destination

Hence: $18n = 210$

$$x = \frac{210}{8} = 11.67 \text{ hours.}$$

Q17. we know that if diagonals of a parallelogram bisect each other at right angles, then it is a Rhombus.



$$\text{let } AC = 24, \quad BD = 10, \quad AO = OC = 12 \\ OB = OD = 5$$

$$\text{In } \triangle COD, \quad CD^2 = OC^2 + OD^2$$

$$CD^2 = 12^2 + 5^2$$

$$= 144 + 25$$

$$CD^2 = 169, \quad CD = 13.$$

Hence, $AB = BC = CD = AD = 13$

\therefore ABCD is a Rhombus.

Hence area of Rhombus = $\frac{1}{2}$ Product of diagonals

$$= \frac{1}{2} \times 24 \times 10$$

$$= 120 \text{ unit}^2.$$

Q18. $\angle BMC = 25^\circ + 45^\circ = 70^\circ$ (Ext. Angle property)

Since $BM = BC$
Therefore $\angle CMB = \angle MCB = 70^\circ$
 $\Rightarrow x = 70^\circ$

Q9. In $\triangle ABC$, $AC^2 = AB^2 + BC^2$

$$AC^2 = 8^2 + 6^2 = 64 + 36$$

$$AC^2 = 100$$

$$AC = 10$$

Area of $\triangle ABC = \frac{1}{2} B \times h = \frac{1}{2} \times 8 \times 6$

$$= 24 \text{ unit}^2.$$

$$\text{Area} = 24 \text{ unit}^2$$

$$\frac{1}{2} \times AC \times BM = 24$$

$$\frac{1}{2} \times 10 \times x = 24$$

$$x = \frac{24}{5} \text{ units}$$

Q20.

$$\angle ADB = 120^\circ$$

Then $\angle ACB = 120^\circ$ (\angle from same arc)

Similarly,

$$\angle DBC = 30^\circ \text{ (given)}$$

$$\angle DAC = 30^\circ$$

In $\triangle ODA$

$$\angle DOA = 180^\circ - 150^\circ = 30^\circ$$

$$\angle DOA = \angle COB \text{ (VOA)}$$

$$30^\circ + \angle COD = 180^\circ \text{ (Linear pair)}$$

$$\angle COD = 150^\circ.$$

$$\angle BDE = \angle ACE = 60^\circ \text{ (Linear pair)}$$

In Quadrilateral ODEC

$$150^\circ + 60^\circ + 60^\circ + x = 360^\circ$$

$$\boxed{x = 90^\circ}$$

Q21. If we observe the word, GLOBALHELLFRY
The ten distinct letters when replaced
with distinct digits we will get
all the digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)
Any number which formed by arranging
the above mentioned digits will have
the sum of digits as:

$$0+1+2+3+4+5+6+7+8+9 = 45.$$

The number 45 is divisible by 3.

Hence the number will always be
divisible by 3. Hence such a heat wave
can never occur.

Q22. Green Octopus has odd legs, because
it says blue octopus has even legs
which means blue octopus never lies.

For Purple octopus:

It says "I have nine"

Assuming the above statement is true.

Then purple octopus has odd legs,
and Blue octopus also has odd legs as
both of them are saying blue octopus
has eight legs. which has to be lie.
Hence above statement is lie.

If the above statement is a lie.

it means purple octopus has odd no. of
legs and Blue octopus does not have eight
legs. Hence blue octopus have odd no. of
legs.

The striped octopus statement is
~~not~~ true. Hence it has even number of legs.
striped octopus has eight legs.

Q23.

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7 = Case 8
Person I	T	T	T	T	L	L	L
Person II	T	T	L	L	T	T	L
Person III	T	L	T	L	T	L	T
					✓		

only Case 5 is correct:

Third one says: "ONE".

Q24. Let us assume that number of ten bags in the box are k .

The number of cups of tea which can be made using k tea bags is between $2k$ to $3k$.

We know 41 and 58 cups of tea were made hence we need the value of k .

which has 41 and 58 in the range of values.

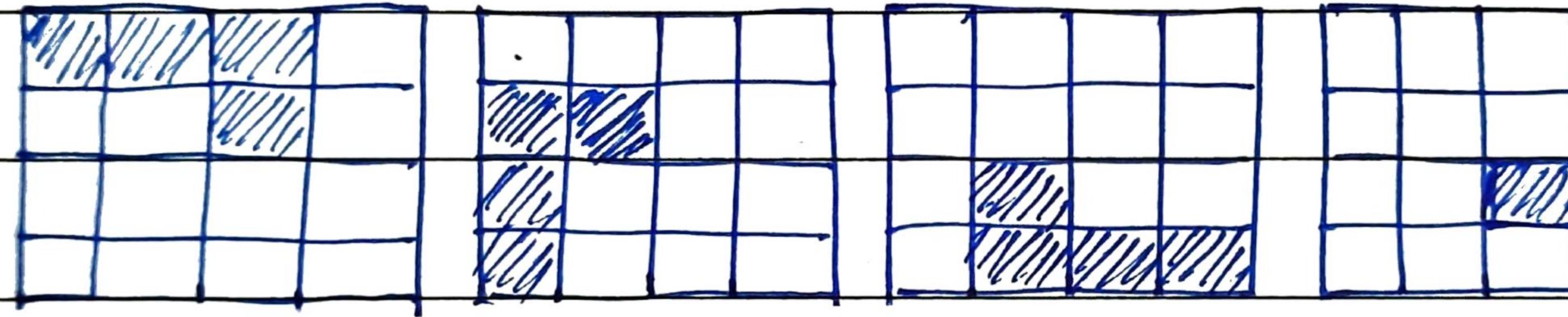
at $k=1$, range is 2 to 3.

at $k=2$ range is 4 to 6.

doesn't satisfy.

at $k=20$ range is 40 to 60 which satisfies the range.

Q25.



Q26



Distance from school from B = $3-x$ km

Distance travelled by students of village

$$B = 50(3-x) = 150 - 50x \text{ km}$$

Distance of school from A = x km

Distance travelled by students of village

$$A = 100x \text{ km}$$

Total distance travelled

$$\begin{aligned} \text{By students of } &= 100x + 150 - 50x \\ \text{village A and B} & \\ &= 50x + 150 \text{ km} \end{aligned}$$

To minimise the distance : $x=0$

Total Distance Travelled = 150 km.

Hence, school should be in village A.

Q27. Tea cups = 5, Sauces = 4, Spoons = 3

Different to way to buy two items.

1. cups and saucer = ${}^5C_1 \times {}^4C_1$

2. plates and spoons = ${}^4C_1 \times {}^3C_1$

3. Spoon and cup = ${}^3C_1 \times {}^5C_1$

Now Adding All = ${}^5C_1 \times {}^4C_1 + {}^4C_1 \times {}^3C_1 + {}^3C_1 \times {}^5C_1$

$$= 5 \times 4 + 4 \times 3 + 3 \times 5$$

$$= 20 + 12 + 15$$

$$= 47.$$

28. Number of possible outcome.

ABCA, ACBA, BACA, BCAA,

BAAC, CAAB, CABA, CBAA,

AABC, AA CB, AB AC, ACAB.

Q29. $2^8 + 1 = 257$

7^3 is smallest perfect cube = 343

$$2^{18} + 1 = 2^{10} \times 2^8 + 1 = 1024 \times 256 + 1$$

$$= 262144 + 1$$

$$= 262145$$

List of perfect cube = $7^3, 8^3, \dots, 64^3$

Number of cubes = $(64 - 7) + 1$

$$= 58.$$

Q30.

6	2
5	4
3	

Let the side of square 4 be y

Then the side of square 3 = $y+1$

Let the side of square 6 = x

Side of square 2 = $x-1$

$$\begin{aligned}\text{Side of square 2} &= \text{Side of square 3} + 1 \\ &= y+1+1 = y+2\end{aligned}$$

$$x-1 = y+2$$

$$x = y+3 \quad \text{--- (1)}$$

Side of square 5 = Side of square 4 = y

Side of square 6 = $2y-1$

$$x = 2y-1 = \text{--- (2)}$$

Put (2) in (1)

$$x = y+3 ; 2y-1 = y+3$$

$$2y-y = 3+1$$

$$y = 4$$

$$x = 2y-1 = 8-1 = 7$$

$$x = 7$$

Side of square (largest) = 7 units.