**Week 2 Lab A**

Q1) Given : 2 hourglass of 4 minutes and 7 minutes, the task is to measure 9 minutes.

**Step 1 ) At 0 minutes:**Start both hourglasses at the same time.

**Step 2) At 4 minutes:** 4 minutes hourglass finishes and then flip it. 7 minutes hourglass is left with 3 minutes.

**Step 3) At 7 minutes:** 4 minutes hourglass is left with 1 minute. 7 minutes hourglass finishes and then flip it.

**Step 4) At 8 minutes:** 4 minutes hourglass finishes and 7 is filled with 6 minutes and 1 minute on the other side. Flip it as the sand is left with 1 minute.

**Step 5 ) At 9 minutes:** 7 minutes hourglass becomes empty from above side.

Hence we measured 9 minutes.

**Q2) Step 1**- Set fire to both ends of one rope. Simultaneously, set fire to one end of the other rope. The rope lit from both ends will take one hour to burn completely because it has twice the burning rate.

**Step 2**- Just as it finishes burning, the other rope would have burned for one hour with one hour remaining.

**Step 3**- Now light this rope (second one) from the other end as well, so that the remaining part burns in 30 minutes.

So in this way we can measure 1hr 30min.

Q3) Let the number of gold coins in the King’s treasury before he ordered be x.

**Step1**) 1st servant goes and triples the treasury and takes back 1 gold coin i.e. Treasury left after the first servant leaves=3x-12

**Step 2)** 2nd servant goes and triples the treasury and takes back 1 gold coin i.e. Treasury left after the second servant leaves= (3(3x-1)-1)=9x-4

**step 3)**3rd servant goes and triples the treasury and takes back 1 gold coin i.e. Treasury left after the third servant leaves= (3(9x-4)-1)=27x-13

According to the problem, the king’s treasury was left with 500 gold coins.

Equating we get, 27x-13=500

→ x=19.

Hence there were 19 gold coins in the King’s treasury before he ordered.

**S E N D**

**M O R E**

Q4)

**+**

STEP 1) M can be either 0 or 1.

**M O N E Y**

M=1 (M≠ 0 is given )

Step 2) As S is a single digit number O can be either 0/1.But as M = 1, so O=0.

Step 3) Now we have 2 cases, S+M+1=10 (considering carryover from 3rd coloumn) or S+M=10.

Let S+M=10,

→S=9

Step 4) now we see another 2 cases, Either E+O+1=N (considering carryover from 2nd coloumn) or E+O=N (which is not possible because E≠N).So E+O+1=N or E+1=N. ------- eq.1

Step 5)now we have again 2 cases,

|  |  |
| --- | --- |
| N+R+1=E+10 10 (considering carryover from 1st coloumn)  E+1+R+1=E+10 (from eq.1)  →R=8 | N+R=E+10  E+1+R=E+10 (from eq.1)  →R=9  Which is not possible because S=9. |

So, R=8.

Step 6) As we know N is a single digit no. ,so E≤8 (from eq.1).

Step 7) now, D+E=Y+10.From the available digits ,we know that D+E≥12 so we have again two cases,

|  |  |
| --- | --- |
| 6+7=Y+10  Which gives Y=2 | 5+7=Y+10  Which gives Y=3 |

We can observe that from both the cases either D is equal to 7 or E is equal to 7.

→E≠7 as N≠8 (from eq.1) because R=8.

→hence D=7.

Now either E is equals to 5 or 6 .

|  |  |  |
| --- | --- | --- |
| If E=5 then N=6. | If E=6 then N=7. Which is not possible as D=7. |  |

So E=5 and N=6.Also Y=2.

Thus, SEND=9567 AND MORE=1085 WHICH GIVES US MONEY=10652.

**Q5)** Let the first train A move at **50** km/h.

And the second train B move at **70** km/h.

The relative velocity of A wrt B = 50 – (- 70) = 120km/h.

Given : the distance between the 2 trains is 100km.

Time taken to collide= 100/120= 5/6 hrs

the speed of bee  IS = **80** km/h. (given)

Therefore, distance covered by bee is = speed\*time → (5/6)\*80=66.67km