

**Total points possible: 82**

1. **(5)** Divide the nine containers into 3 equal groups. Pick any two groups and place one group on each side of the balance scale. There are two possibilities: the pans balance or the pans do not balance.

If the pans balance the light one is in the third group.

If the pans do not balance the light one is in the group on the light side of the balance.

Take the group of three with the light container. Choose any two and place them on the balance.

If the scale is balanced the light one is the third one.

If the scale is not balanced the light one is on the high side of the balance.

2. **(12- 2 pts per answer; 4 pts explanation)**

$$P=2; A=1; R=7; T=8$$

$P \times 4 =$  a single digit answer equal to  $T$ : therefore  $P$  can only equal 1 or 2

If  $P = 1$  then  $4T = 1, 11, 21, 31, 41, 51, 61, 71, 81$  none of which are multiples of 4

if  $P = 2$  then  $4T = 2, 12, 22, 32, 42, 52, 62, 72, 82$ : The only multiple of 4 is 32

This tells us that  $T$  must equal 8

$4 \times R = A$  and  $4 \times A = R$  we know that each must be a single digit leaving 1, 3, 4, 5, 6, 7, 9

Using trial and error we can solve for  $A$  and  $R$ .

3. **(10 – 2 pts per answer; 4 explanation)**

C, two hours and two minutes; B, two hours and four minutes; A, two hours and 6 minutes.

Looking at how long it takes for test tube C to get to the original amount in test tube D you get 2 minutes. This tells us that it will take an additional 2 minutes added to the 2 hours to fill test tube C. It takes test tube B an additional 2 minutes to equal test tube C giving test tube B an additional two minutes to test tube C. It takes test tube A an additional 2 minutes to equal test tube B.

4. **(7 – 3 answer (must include label for 3 points); 4 explanation)**

20 Kilograms

We know that  $18\% + 16.4 =$  whole watermelon, therefore, we know that

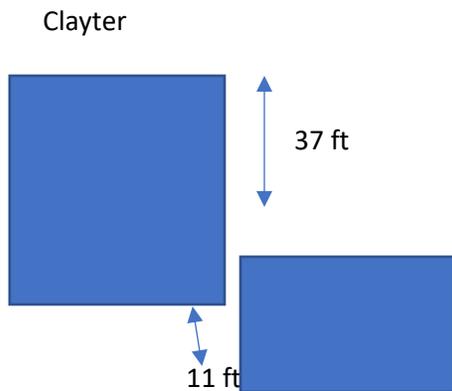
$$1 \text{ whole watermelon} - .18 \text{ watermelon} = 16.4 \quad w = 1 \text{ whole watermelon}$$

$$.82 w = 16.4 \text{ kilograms} \quad \text{or} \quad 82 w = 1640 \text{ kilograms}$$

$$w = 20 \text{ kilograms}$$

**5. (8 – 2 pts per answer; 4 explanation)**

The depth of Clayter Lake is 52 feet and the depth of Dinsmore Lake is 26 feet.

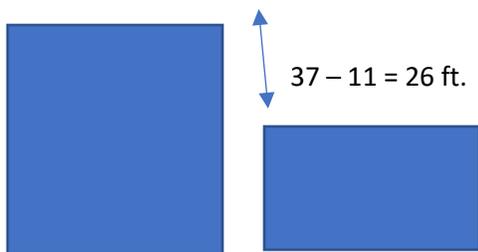


Algebraic Solution

$$C = 2D$$

$$C = 37 + (D-11)$$

$$2D = 37 + (D-11)$$

$$D = 26, C = 52$$


Move the lake bottoms so that they are even. The difference between the surfaces must be half the depth of Clayter Lake, so  $26 \times 2 = 52$  feet is the depth of Clayter Lake and 26 feet is the depth of Dinsmore Lake.

Teams could also use guess and check.

**6. (6 – 2 answer; 4 explanation)**

The first bell will ring again at:

6:25; 6:50; 7:15; 7:40; 8:05; 8:30; 8:55; 9:20

The second bell will ring again at:

6:40; 7:20; 8:00; 8:40; 9:20

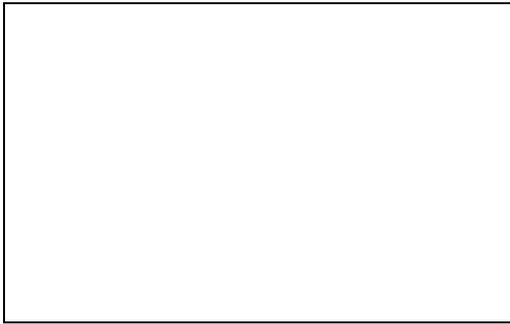
So they will next ring together at 9:20

Or....

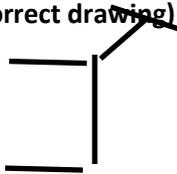
We know that I am looking for the least common multiple of 25 and 40 which is 200. 200 minutes is equal to 3 and  $\frac{1}{3}$  hours or 3 hours and 20 minutes. If we add 3 hours 20 minutes to 6:00 we get 9:20 AM.

7. (5 – correct drawing)

Outside borders show the 16 rearranged toothpicks.



8. (3 – correct drawing)



9. (14 – 1 pt for each correct position plus 1 pt. each = ; 4 explanation)

H, A=D, F, C, B=E, J

First we needed to make all ratios reflect the same mix (either grape to water or water to grape or water to whole or grape to whole). When all are the same we can then compare them listing them in order with more water to grape moving to less water to grape ( or less grape to water moving to more grape to water). They may also find a decimal to help with the analysis.

10. (12 – 1 pt. per correct answer)

D	B	Z
X	V	T
R	P	N
M	K	I