Jakarta International School

8th Grade – AG1

Practice Test - BLACK

Unit 1: Solving Linear Equations

Name: SOLUTIONS

Date:

Score: $\frac{}{20}$

Goal 2: Use problem solving processes and skills to solve real world problems.

Clearly show required work and follow direction to earn full credit!!!

For each problem, complete the 4 step problem solving process.
(4 points per problem – 1 point for each step)

1. **Define a variable expression for all unknowns**
2. **Write an equation for the situation**
3. **Find the solution and write your answer in a meaningful way**
4. **Check your solution with the facts from the problems**

1. At what time after 7:00 will the minute hand overtake the hour hand?

Let r = the speed of the hour hand

$12r$ = the speed of the minute hand

x = the distance the minute hand must travel (in minutes)

$x - 35$ = the distance the hour hand must travel (in minutes)

When the 2 hands meet, $T_{\text{HOUR HAND}} = T_{\text{MINUTE HAND}}$

$$\frac{x-35}{r} = \frac{x}{12r}$$

$$\frac{12r(x-35)}{r} = \frac{xr}{r}$$

$$12(x-35) = x$$

$$\frac{11x}{11} = \frac{420}{11}$$

$$x = 38\frac{2}{11}$$

so, the minute hand will overtake the hour hand at $7:38\frac{2}{11}$

2. A number, N_2, is 40% more than the number N_1, the number N_3 is 25% more than N_2, and the number N_4 is x% less than N_3. For what value of x is $N_4 = N_1$?

$$N_4 = \left(1-\frac{x}{100}\right)N_3 = \left(1-\frac{x}{100}\right)\left(1+\frac{25}{100}\right)N_2$$

$$N_4 = \left(1-\frac{x}{100}\right)\left(1+\frac{25}{100}\right)\left(1+\frac{40}{100}\right)N_1$$

if $N_4 = N_1$ then, $N_1 = \left(1-\frac{x}{100}\right)\left(1+\frac{25}{100}\right)\left(1+\frac{40}{100}\right)N_1$

$$1 = \left(1-\frac{x}{100}\right)\left(\frac{5}{4}\right)\left(\frac{7}{5}\right)$$

$$1 = \left(1-\frac{x}{100}\right)\cdot\frac{35}{20}$$

$$\frac{20}{35} = 1 - \frac{x}{100}$$

$$\frac{x}{100} = \frac{15}{35}$$

$$\boxed{x = 42\frac{6}{7}}$$

3. A merchant on his way to the market with n bags of flour passes through three toll gates. At the first gate, the toll is $\frac{1}{8}$ of his holdings, but 4 bags are returned. At the second gate, the toll is $\frac{1}{4}$ of his (new) holdings, but 3 bags are returned. At the third gate, the toll is $\frac{1}{3}$ of his (new) holdings, but 1 bag is returned. The merchant arrives at the market with exactly $\frac{n}{2}$ bags. If all transactions involve whole bags, find the value of n.

The # of bags remaining after the first toll is $n - \frac{1}{8}n + 4 = \frac{7}{8}n + 4$

After the 2nd toll, $\frac{3}{4}\left(\frac{7}{8}n + 4\right) + 3 = \frac{21}{32}n + 3 + 3 = \frac{21}{32}n + 6$

After the 3rd toll, $\frac{2}{3}\left(\frac{21}{32}n + 6\right) + 1 = \frac{7}{16}n + 5$

$$\frac{7}{16}n + 5 = \frac{n}{2}$$

$$5 = \frac{1}{16}n$$

$$80 = n$$

$\boxed{\text{80 bags of flour}}$

4. Mr. and Mrs. Gonzalez and their two children, Hector and Vicenta, are competing in a running race as part of a community celebration. The race consists of four laps, and each lap is run by a different family member.

The family decides they will start with their slowest runner and work up to their fastest, so Hector runs the first lap. Vicenta, whose running speed is 50% faster than her little brother's, runs the second lap. Mrs. Gonzalez, who is one third faster than Vicenta, runs the third lap. Finally Mr. Gonzalez, who is one fourth faster than his wife, runs the final lap.

If the family finished the whole race in 5 minutes and 8 seconds, how long did it take Vicenta to run her lap?

Let t = the time it takes Hector to run 1 lap.

Vicenta would run 1.5 laps in time, t, so it would take her $\frac{2}{3}t$ minutes to run her lap since 1 is $\frac{2}{3}$ of 1.5.

Mrs. Gonzalez will cover $1\frac{1}{3} \cdot 1.5 = 2$ laps in time t.
Since 1 is $\frac{1}{2}$ of 2, it would take her $\frac{1}{2}t$ to run her lap.

Mr. Gonzalez will cover $\frac{5}{4} \cdot 2 = 2\frac{1}{2}$ laps in time t.
Since 1 is $\frac{2}{5}$ of $2\frac{1}{2}$, it would take him $\frac{2}{5}t$ to run one lap.

So $t + \frac{2}{3}t + \frac{1}{2}t + \frac{2}{5}t = 308$

$$\frac{30}{30}t + \frac{20}{30}t + \frac{15}{30}t + \frac{12}{30}t = 308$$

$$\frac{77}{30}t = 308$$

$$t = 120 \text{ seconds} = \text{Hector's time}$$

Vicenta's time $= \frac{2}{3}t = \frac{2}{3} \cdot 120 = \underline{80 \text{ seconds}}$.

5. **Tennis Anyone?** A tennis player computes her "win ratio" by (number of matches won) divided by (total number of matches played). At the start of a weekend, her win ratio is 0.500. During the weekend, she wins three matches and loses one. At the end of the weekend her win ratio is greater than 0.503. What is the greatest number of matches she could have won before the weekend began?

let x = the number of games she has won so far
$2x$ = the number of games she's played

After winning 3 games and losing 1, her win ratio is now

$$\frac{x+3}{2x+4}$$

$$\frac{x+3}{2x+4} > \frac{503}{1000}$$

$$1000(x+3) > 503(2x+4)$$

$$1000x + 3000 > 1006x + 2012$$

$$988 > 6x$$

$$x < 164.666$$

$$\text{so } x \le 164$$

So the greatest number of tennis matches she could have won is 164.