

Algebra Round

45 minutes

Please put all answers on the provided answer sheet, units are not required.

1. Rapunzel's tower is 20 "ells" high. One "ell" is 44 inches. If it takes 220 Pascals to match the height of the tower, how many feet are in a Pascal?

Pascal = $\frac{1}{3}$ of a foot

2. Lightning McQueen has raced 54 races over the past year. He has lost 5 times as many races as he has won. How many races has he lost?

Answer: 45

3. A blue lightsaber takes 15 hours for Yoda to make. A red lightsaber takes 11 hours for Yoda to make. If Yoda made 20 lightsabers in 6 days, how many red lightsabers did Yoda make?

Ans: 15

Set up the equations $r + b = 20$ and $15b + 5r = 240$ (24 hours in a day, 10 days total \gg 240 hours)

Solve. $r = 15$, $b = 5$

4. Cinderella's slippers used to cost \$1,000 in 2021. Because of inflation, the price has increased. If inflation was 10% per year, what would the price of her shoes be this year (2023)?

Ans: \$1210: $1000 \times 1.1 \times 1.1$ (1.1 comes from 10% increase in price)

5. Shrek visits his swamp. Donkey says it's cold and shows the temperature. Shrek asks if it's in Celsius or Fahrenheit. Donkey says, "Doesn't matter, the temperature is the same both ways." Find the temperature of the swamp. Hint:
 $^{\circ}\text{C} = (9/5) (^{\circ}\text{F}) + 32$

Ans: - 40°

F = C (substitute F for C)

$$F = (9/5 F) + 32.$$

$$F - 9/5F = 32$$

$$F (1-9/5) = 32$$

$$F = 32 (-5/4)$$

$$F = - 40$$

6. Rasputin is flying right at 88 feet per second and sees a carriage traveling - relative to him - left at 58 feet per second. After Rasputin travels 176 feet, how far has the carriage traveled in the same amount of time?

Ans: 60

The carriage must be traveling 88-58=30 feet per second right, and Rasputin takes 176/88= 2 seconds to travel 176 feet. So the carriage travels 30 x 2 = 60 feet

7. Moana has 4 fishing boats that each have a distinct positive number on them. The numbers on each boat form an arithmetic sequence and the sum of the numbers on each boat is 46. Of the possible numbers that could be on Moana's fish boats, what is the greatest possible number that can be on a boat? Note: An arithmetic sequence is a sequence of numbers where each term increases by adding/subtracting some constant k. (ex. 1, 4, 7, 10... is an arithmetic sequence because the difference between each number is always 3)

Ans: 22

$$x + x + y + x + 2y + x + 3y = 46$$

$$4x + 6y = 46$$

$$2x + 3y = 23$$

Maximized spread » largest number ... x to be as little as possible....

$$X = 0 \Rightarrow 3y = 23 \dots \text{not integer}$$

$$X = 1 \Rightarrow 3y = 21 \dots y = 7$$

$$\text{4th term} = \text{largest number} = x + 3y = 1 + 3(7) = 22$$

8. Olaf melts when temperatures rise above 0 degrees celsius. On a given day, the temperature can be modeled by the function $C = -\frac{1}{8}(t)^2 + 3t - 16$, where C is the temperature in celsius, and t is the hour of the day. At what hour will Olaf first begin to melt?

Ans: 8

Set the equation = 0

$$0 = -\frac{1}{8}(t)^2 + 3t - 16$$

$$0 = -x^2 + 24x - 128$$

$$0 = x^2 - 24x + 128$$

$$(x-16)(x-8) = 0$$

$$X = 8, 16$$

$$8 < 16$$

9. Judy Hopps is taking a test. Tests are scored from 0-100. She got an average of x on the first 5 tests. After the 6th test, her average became a 90. What is the lowest possible value of x?

Ans: 88

10. Sven fed a total of 84 carrots to his reindeer. He feeds each female reindeer as many carrots as there are female reindeer and feeds each male reindeer as many carrots as there are male reindeer. If he has 2 more male reindeer than female reindeer, how many reindeer does Sven have in total?

Ans: 18

If x = the number of female reindeer Sven has...

$$x^2 + (x+2)^2 = 164$$

$$x^2 + x^2 + 4x + 4 = 164$$

$$2x^2 + 4x - 160 = 0$$

$$x^2 + 2x - 80 = 0$$