

SOML MEET 3
EVENT 1
Applications of Algebra

NAME: _____
TEAM: _____
SCHOOL: _____

1. [2 Points] Al can do a job in four hours, but Bob would need six hours to do the same job. How long does it take them to complete the job together? Assume that they do not interfere with each other's work.

ANS: _____ **hours** _____ **minutes**

2. [3 Points] I'm thinking of two consecutive integers. If I subtract their sum from their product I get 41. Find every pair of integers that satisfy this condition.

ANS: _____

3. [5 Points] If I make a round trip, traveling one direction at 30 miles per hour and returning at 50 miles per hour, what is my average speed for the round trip?

ANS: _____ **mph**

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1. [2 Points] Al can do a job in four hours, but Bob would need six hours to do the same job. How long does it take them to complete the job together? Assume that they do not interfere with each other's work.

Solution: Let x = number of hours Al and Bob work

In each hour, Al does $\frac{1}{4}$ of the job. In x hours, he will do $\frac{x}{4}$ of the job.

In each hour, Bob does $\frac{1}{6}$ of the job. In x hours, he will do $\frac{x}{6}$ of the job.

Together, they complete 1 whole job: $\frac{x}{4} + \frac{x}{6} = 1$

Multiply both sides by 24: $6x + 4x = 24$

$$10x = 24$$

$$x = 2.4 \text{ hours} = 2 \text{ hours and } 24 \text{ minutes}$$

ANS: 2 hours 24 minutes

2. [3 Points] I'm thinking of two consecutive integers. If I subtract their sum from their product I get 41. Find every pair of integers that satisfy this condition.

Solution: Let x = smallest integer, $x+1$ = largest integer

Then their product is $x(x+1)$ and their sum is $2x+1$.

According to the problem, $x(x+1) - (2x+1) = 41$

Solve: $x^2 + x - 2x - 1 = 41$

$$x^2 - x - 42 = 0$$

$$(x-7)(x+6) = 0 \quad \text{So } x = 7 \text{ or } x = -6$$

The two consecutive integers could be 7 and 8.

They could also be -6 and -5

ANS: 7 and 8 OR -6 and -5

3. [5 Points] If I make a round trip, traveling one direction at 30 miles per hour and returning at 50 miles per hour, what is my average speed for the round trip?

Solution: Let d = distance in one direction, $2d$ = the distance for the round trip (both in miles).

Since $\text{time} = \frac{\text{distance}}{\text{rate}}$, the time (in hours) spent going is $\frac{d}{30}$ and time spent returning is

$$\frac{d}{50}$$

The total time spent for the round trip is $\left(\frac{d}{30} + \frac{d}{50}\right)$

$$\text{average rate} = \frac{\text{total distance}}{\text{total time}} = \frac{2d}{\left(\frac{d}{30} + \frac{d}{50}\right)}$$

Multiply numerator and denominator by 150:

$$\text{average rate} = \frac{300d}{(5d + 3d)} \quad \text{Simplify: } \text{average rate} = \frac{300d}{(5d + 3d)} = \frac{300d}{8d} = 37.5 \quad \text{ANS: 37.5 mph}$$