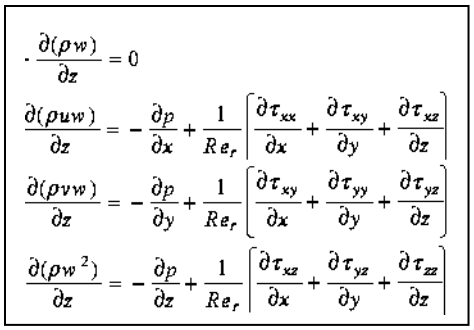
# Number Sentence Puzzles



$$-\frac{\partial(\rho w)}{\partial z} = 0$$

$$\frac{\partial(\rho uw)}{\partial z} = -\frac{\partial p}{\partial x} + \frac{1}{Re_r}\left[\frac{\partial \tau_{xx}}{\partial x} + \frac{\partial \tau_{xy}}{\partial y} + \frac{\partial \tau_{xz}}{\partial z}\right]$$

$$\frac{\partial(\rho vw)}{\partial z} = -\frac{\partial p}{\partial y} + \frac{1}{Re_r}\left[\frac{\partial \tau_{xy}}{\partial x} + \frac{\partial \tau_{yy}}{\partial y} + \frac{\partial \tau_{yz}}{\partial z}\right]$$

$$\frac{\partial(\rho w^2)}{\partial z} = -\frac{\partial p}{\partial z} + \frac{1}{Re_r}\left[\frac{\partial \tau_{xz}}{\partial x} + \frac{\partial \tau_{yz}}{\partial y} + \frac{\partial \tau_{zz}}{\partial z}\right]$$

Scientific research has a lot in common with solving number puzzles like SODUKO in order to figure out what stars or planets are doing in space. Use your puzzle-solving ability to figure out what event is described by the following number sentences!

**1 - Which story matches the sentence 23 – 10 + 6 = 19 ?**

A) An astronomer discovers 23 quasars on one photograph, 10 quasars on a second photograph, and 6 additional quasars on a third photograph. How many quasars did she identify?

B) An astronomer spots 23 flares on Tuesday and 6 flares on Thursday, then decides that 10 of the flares were not real. How many real flares did he see?

C) An astronomer counts a total of 19 craters, and classifies 23 of them as asteroid impacts, 6 of them as volcanic calderas and 10 of them as meteor impacts.

**2 - Which story matches the sentence 145 + N = 375 ?**

A) Two astronomers combined their databases of Seyfert galaxies. They observe a total of 375. If one astronomer contributed 145 galaxies, how many did the second astronomer contribute?

B) The temperature of an asteroid's interior changes by 375 degrees between the center and the surface. If the surface temperature is 145 degrees Centigrade, what is the interior temperature of the asteroid?

C) The width of Saturn's rings is 375 kiloKilometers. If the ring system starts at a distance of 145 kiloKilometers from Saturn's outer atmosphere, what is the distance to the outer edge of the ring system?

**3 - Two astronomers combined their catalogs of cosmic gamma-ray bursts. There were 287 and 598 cataloged by each astronomer with 65 events in common. How many unique events are in the combined catalog?**

A) (287 - 65) + (598 - 65) = M

B) 287 + (598 – 65) = M

C) 287 + 598 = M

D) (287 + 65) + (598 + 65) = M

# Answer Key

**1 - Which story matches the sentence 23 – 10 + 6 = 19 ?**

A) An astronomer discovers 23 quasars on one photograph, 10 quasars on a second photograph, and 6 additional quasars on a third photograph. How many quasars did she identify? **Answer: No. This would be the sentence 23 + 10 + 6 = N**

B) An astronomer spots 23 flares on Tuesday and 6 flares on Thursday, then decides that 10 of the flares were not real. How many real flares did he see? **Answer: Yes this is correct.**

C) An astronomer counts a total of 19 craters, and classifies 23 of them as asteroid impacts, 6 of them as volcanic calderas and 10 of them as meteor impacts. **Answer: No. This is the sentence 23 + 6 + 10 = 39.**

**2 - Which story matches the sentence 145 + N = 375 ?**

A) Two astronomers combined their databases of Seyfert galaxies. They observe a total of 375. If one astronomer contributed 145 galaxies, how many did the second astronomer contribute? **Yes. This is correct.**

B) The temperature of an asteroid's interior changes by 375 degrees between the center and the surface. If the surface temperature is 145 degrees Centigrade, what is the core temperature of the asteroid? **Answer: No. This is the sentence 145 + 375 = N**

C) The width of Saturn's rings is 375 kiloKilometers. If the ring system starts at a distance of 145 kiloKilometers from Saturn's outer atmosphere, what is the distance to the outer edge of the ring system**? Answer: No. This is the sentence 145 + 375 = N**

**3 - Two astronomers combined their catalogs of cosmic gamma-ray bursts. There were 287 and 598 cataloged by each astronomer with 65 events in common. How many unique events are in the combined catalog?**

A) (287 - 65) + (598 - 65) = M **No. This eliminates the common bursts from the final catalog.**

B) 287 + (598 – 65) = M **Yes. This is correct.**

C) 287 + 598 = M - **No. This is just the sum of the two catalogs including duplications.**

D) (287 + 65) + (598 + 65) = **M No. The duplications are added to each not subtracted.**

Answer B is correct. Among the 287 + 598 gamma ray bursts in the two catalogs, there are 65 that are in common. Starting with the full catalog provided by one astronomer (287), we add only the non-duplicated bursts in the second astronomers catalog (598-65).