## Rapid Fire — True or False?

1) $\sqrt{37}$ is a rational number

2) $\sqrt{49}$ is a rational number

3) $\sqrt{101}$ is an irrational number

4) 7, 5, 11.5 can be lengths of sides of a triangle

5) $6+\sqrt{2}$ is a rational number

6) $2^{3^2} = (2^3)^2$

7) $3^{1+\frac{1}{2}} = \frac{9}{\sqrt{3}}$

8) $3^{1+\frac{1}{2}} = 81^{1/2}$

9) $\frac{j}{\sqrt{j}} = j^{-1/2}$

10) $|x+1| = x$ has two solutions.

11) $|x+1| = |x|$ has two solutions.

12) 10% of 10% of 10% = 0.1%

13) $P(A) + P(B) = P(A \text{ or } B) - P(A \text{ and } B)$ for mutually exclusive events 'A' and 'B'.

14) $2n+1$ can either be even or be odd depending on whether $n$ is even or odd ($n \geq 0$ and $n$ is an integer)

15) $n^2$ is always an even number if $n$ is an even number.

16) $n^2-1$ is always an even number if $n$ is an odd number.

17) $(a+b)^2 = |a^2+b^2+2ab|$ for all $a$ and $b$

18) $2^0 = 4^0$

19) $2^0 = \frac{1}{2^0}$

20) if $|x+1| \geq x$ then ~~either~~ ~~$x \geq 0$~~ ~~or~~ ~~$x \leq 0$~~ $x$ can be any number.

21) $2^x = 17$ has no solution for integer values of $x$

22) if $2^y = 8^z$ then $y = 3z$

23) if $|x+1| \geq 5$ then $x$ can be any number.

24) $|x-5| \geq 5$ is true for all negative values of $x$

Problems

1) On a planet far, far away They don't use the decimal number system. Rather they use a number system that has the following "digits"

$\emptyset \quad \not{7} \quad \Delta \quad \bar{X}$

In our world (ie earth), $\emptyset = 0$

$\not{7} = 1$

$\Delta = 2$

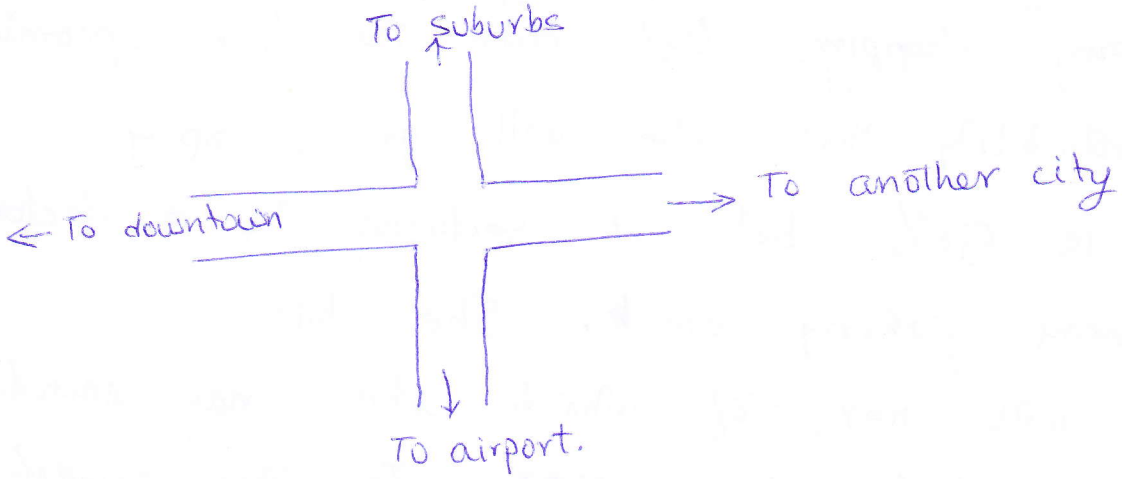
$\bar{X} = 3$

Convert the following number from an inscription on a space ship from that planet into a decimal number.

$\bar{X}\,\Delta\,.\,\emptyset\,\not{7}$

2) On a banyan tree that is a 1000 years old, the trunk has concentric circles, one circle for each year. The circumference of the tree's trunk today is $1000\pi$ inches. What was the tree's trunk's circumference 4 years back, if the diameter of the trunk increases by 2% every year.

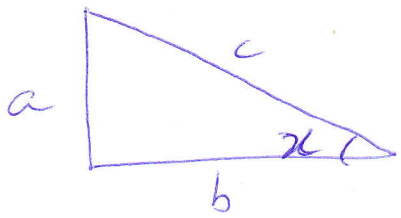
3) In a really congested city in Asia, there is an intersection as shown below.




At 2 am in the night the traffic is very light and at 9 am in the morning there is a lot of traffic. The city council hired you to determine the traffic light programming. (a) Should the duration of traffic light in "green" state be higher at 2am or 9am? (b) Should the duration in "red" state be higher at 2am or 9 am? Assume traffic in all 4 directions is almost same at all hours. Explain your answer.

4) A high school girl named Tina is preparing for SAT Test that is upcoming in 2 months. She loves going shopping, but due to her upcoming test, the probability that she will go shopping this weekend is 50% but it reduces by a factor of half by every passing week. She has a thousand dollars with her, of which she may spend some, all or none, before her SATs. Is this enough information for you to determine the amount of shopping she will do this weekend? If so, what is the expected "dollars" worth of shopping she will do this weekend? And if not, explain what is missing in this data.

5) In this triangle:




if $(\sin x)^2 = \cos x$ and $c = 1$ cm,

Write the equation, which if solved, will lead to the value of 'b'. Extra credit for finding the values a and b.

6) Solve the following for values of $x$ and $y$

$$2x + 3y = 5$$

$$x - y = 10$$