



**Rocket City Math League 2004-2005**  
**Mercury Solutions Round 2**

1. Answer:  $\frac{1}{11}$

The probability that Luke will roll an 11 is one out of eleven.

2. Answer: **4**

In the worst scenario, Ben will have a different toy in each of the first three Martian Happy Meals he buys. Therefore, he must buy at least one more to have at least two of the same kind of toy.

3. Answer: **40**

The following equation can be written using the given information, where x is the number of credits that Princess Leia loses during her fight:

$$\begin{aligned}
 100 - x - \frac{1}{2}(100 - x) - \frac{2}{3}[100 - x - \frac{1}{2}(100 - x)] &= 10 \\
 100 - x - 50 + \frac{1}{2}x - \frac{200}{3} + \frac{2}{3}x + \frac{100}{3} - \frac{1}{3}x &= 10 && \text{(Simplify.)} \\
 600 - 6x - 300 + 3x - 400 + 4x + 200 - 2x &= 60 && \text{(Multiply through by 6 for} \\
 &&& \text{easier solving.)} \\
 -x = -40 &&& \text{(Simplify.)} \\
 x = 40 \text{ credits} &&&
 \end{aligned}$$

4. Answer: **156**

Use the equation distance = rate x time.

$$\begin{aligned}
 d &= rt \\
 &= (150) \left(\frac{52}{3} \times 60\right) \\
 &= 156000 \text{ meters} \\
 &= 156 \text{ kilometers}
 \end{aligned}$$

5. Answer: **4**

Let the circle head equal A, the square head equal B, and the triangle head equal C. Then convert the picture equations into a number system of equations.

$$\begin{aligned}
 AB + C &= 7 \\
 B - 2A &= 1 && \rightarrow && B - 2(10 - B^2) = 1 && \rightarrow && 2B^2 + B - 21 = 0 \\
 &&& && && && \rightarrow && (2B + 7)(B - 3) = 0 \\
 A + B^2 &= 10 && \rightarrow && A = 10 - B^2 && \rightarrow && \text{Plug into the equation above.}
 \end{aligned}$$

Thus,  $B = \{-\frac{7}{2}, 3\}$ . Because the alien heads represent positive integers, B must equal 3. Consequently,  $A = 10 - 3^2 = 1$ . The first equation can be solved:

$$(3)(1) + C = 7 \rightarrow C = 4$$

6. Answer: **51.2 (%) or 256/5 (%)**

Since the rocket uses 20%, or 0.20, of its fuel every minute, then there is 80%, or 0.80, of its fuel left every minute. Because there are three minutes, the following equation can be written and solved using x as the original amount of fuel:

$$0.80(0.80(0.80(x))) = 0.512x$$

0.512x is 51.2% of x.

7. Answer: **Bob**

If the Criminal is	Then the statements of			
	David are	Bob are	Kris are	Chad are
David	False	True	False	True
Bob	False	False	False	True
Kris	True	True	False	True
Chad	False	True	True	False

The only situation in which there are no conflicting statements and only one crewmate ate the ice cream is the one where the last statement is true. Therefore, Bob ate the ice cream.

8. Answer: 5

Find out how often Darth Vader's suit malfunctions on Hoth by using ratios:

$$\frac{2 \text{ IG}}{3 \text{ H}} = \frac{100 \text{ IG}}{? \text{ H}}$$

$$2\text{H} = 300$$

$$\text{H} = 150$$

If Darth Vader's suit malfunctions on the last possible day (day 150), then his suit will malfunction on days 150, 300, 450, 600, and 750, a total of 5 times over during the 798 days.

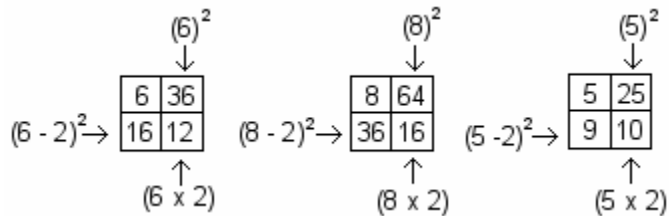
9. Answer: 12096

The product of two numbers can be found by multiplying their greatest common factor and least common multiple. Therefore, the Prodage can be found by:

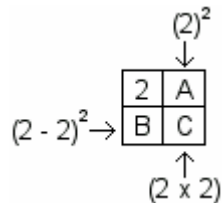
$$(12)(1008) = 12096$$

10. Answer: 8

The following picture illustrates the pattern followed by the grids:



The fourth grid also follows the same pattern:



So  $A = 4$ ,  $B = 0$ , and  $C = 4$ .  $4 + 0 + 4 = 8$ .

11. Answer: Wednesday

If tomorrow is Sunday, then today is Saturday. Since the next leap year is in 2 years, then the leap year does not have to be taken into account. The Center will turn 1 year old in 365 days after it was built, which was 256 days ago.

$$365 - 256 = 109$$

The Center will turn 1 year old in 109 days. 109, when divided by 7, gives a remainder of 4. Therefore, the Center will turn 1 year old in 4 days after a Saturday, which is Wednesday.

12. Answer:  $\frac{133}{4}$

The largest S will be produced when  $4 \times 8$  or  $8 \times 4$ , because they give the largest product of 32. There also must be a + before and no  $\div$  after the  $8 \times 4$ , so that a positive 32 will be added. Thus, the 3 equations that produce large positive numbers are:

$$2 \div 3 + 4 \times 8 - 4 = \frac{86}{3}$$

$$2 \div 3 - 4 + 8 \times 4 = \frac{86}{3}$$

$$2 - 3 \div 4 + 8 \times 4 = \frac{133}{4}$$

The largest S is  $\frac{133}{4}$ .