

MATH 5: HANDOUT 16
POWER $\frac{1}{2}$. BEGINNING PROBABILITY – 1.

POWER $\frac{1}{2}$

We know how to raise numbers into whole powers:

$$a^n = a \times \cdots \times a.$$

But what is $a^{\frac{1}{2}}$?

Example: Let's try to figure out what $4^{\frac{1}{2}}$ is:

$$4^{\frac{1}{2}} \times 4^{\frac{1}{2}} = 4^{\frac{1}{2} + \frac{1}{2}} = 4^1 = 4.$$

We can see that $4^{\frac{1}{2}}$ must be a number, such that if we multiply it by itself, we get 4. But this is just a square root of 4! So, we get:

$$4^{\frac{1}{2}} = \sqrt{4}.$$

In general, this is also true:

$$a^{\frac{1}{2}} = \sqrt{a}.$$

BEGINNING PROBABILITY THEORY

We will be talking about “tests” (such as tossing a coin, rolling a die, drawing a card, etc), each of which can result in one of several possible outcomes (e.g., rolling a die can give numbers 1 through 6, flipping a coin can give either heads or tails). If there are n possible outcomes, and they are all equally likely, then probability of getting any given is exactly $1/n$; for example, probability of having a Head when flipping a coin is $1/2$.

In general, if we ask what is the probability of getting one of a certain collection A of outcomes, then the answer is given by

$$P(A) = \frac{\text{number of outcomes giving } A}{\text{total number of possible outcomes}}$$

HOMEWORK

1. Write each of the following expressions in the form $2^m 5^k$:

(a) $\frac{2^2 5^8}{2^5 5^3}$

(b) $(2^3)^2 10^2 5^{-3}$

(c) $\frac{2^8 5^{-14}}{10^{-3}}$

2. Solve the following equations:

(a) $5 - 2(3 - x) = -2$

(b) $1 - \frac{2}{3}(x + 1) = x$

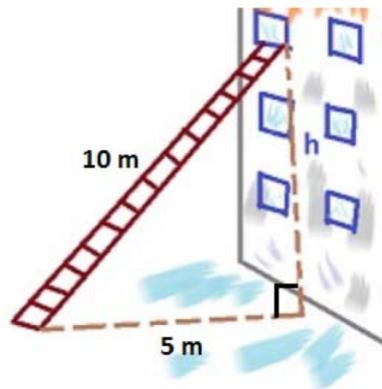
(c) $\frac{x - 2}{x - 4} = -2$

3. Compute:

(a) $3^7 + 3^7 + 3^7 = 3^?$ Hint: use distributive property

(b) $\frac{2^{1001} 3^{999}}{6^{1000}} = 2^? 3^?$

4. Find the distance from the window to the ground h . Hint: use Pythagorean theorem.



5. Open parenthesis and simplify

(a) $3(a - 5) - 2(2a - 9) =$

(b) $12x - 3x(x + 4) =$

(c) $5x - 5(7 - a + x) =$

(d) $2a(a - 2) - a(a - 1) =$

6. What is the probability that a randomly chosen person was born:

(a) in January

(b) on Feb 5?

(c) on Sunday?

When doing this problem, you can ignore leap years and assume that birthdays are randomly distributed among all days of the year, so each day is equally likely; in real life it is not quite true.

7. A class has 28 students. The teacher organized a meeting with parents, and 24 mothers and 18 fathers came to it. How many students had both mother and father at the meeting with parents?