Halloween maths activities for IB Maths SL and HL: Beyond school

IB Math Revision · Beyond school: for adults and maths fans · 31 October · Student sheet

Name _____ Class _____ Date _____

No calculator needed. Every answer works out exactly.

Starter (5 minutes)

1. Friday the 13th: what is the last digit of 13^{13}?

2. A cave holds 20 spiders and bats with 76 legs between them. A spider has 8 legs and a bat 2. How many spiders are there?

3. Find the smallest whole number that leaves remainder 1 when divided by 2, 3, 4, 5 and 6, and is a multiple of 7.

4. How many three-digit numbers have digits that add up to 13?

Main activity (30 minutes)

Task A: The haunted staircase

A ghost climbs a staircase, going up 1 or 2 steps at a time.

a. In how many ways can it climb 4 steps?

b. Explain why the number of ways for n steps is the number for $n - 1$ plus the number for $n - 2$. How many ways are there for 10 steps?

c. The ghost now refuses to take two 2-steps in a row. How many ways are there for 10 steps?

Task B: Masks and pumpkins

Probability with a twist.

a. Four trick-or-treaters put their masks in a pile, and the masks are handed back at random. What is the probability that nobody gets their own mask?

b. With more and more trick-or-treaters this probability gets closer and closer to $1/k$ for a famous constant k. Which constant?

c. Two witches each pick a whole number from 1 to 100 at random. What is the probability that their numbers differ by at most 1?

Extension

1. A pumpkin is a sphere of radius 10 cm. A cylindrical hole of radius 6 cm is drilled straight through its centre. Find the volume that is left, in the form $k\pi$ cm^3.