

## Quiz #12

### SOLUTIONS

1. { 4 points } Find the value of each of these quantities.

(a)  $P(5, 2) = \frac{5!}{3!} = 5 \cdot 4 = 20$

(b)  $C(7, 4) = \frac{7!}{4!3!} = \frac{7 \cdot 6 \cdot 5 \cdot 4}{1 \cdot 2 \cdot 3 \cdot 4} = 35$

2. { 6 points } A coin is flipped nine times where each flip comes up either heads or tails. How many possible outcomes.

(a) contain exactly four heads

$$C(9, 4) = \frac{9!}{4!5!} = \frac{9 \cdot 8 \cdot 7 \cdot 6}{1 \cdot 2 \cdot 3 \cdot 4} = 126$$

(b) contain exactly two tails

$$C(9, 2) = \frac{9!}{2!7!} = \frac{9 \cdot 8}{1 \cdot 2} = 36$$

(c) contain at least three heads

$$\begin{aligned} & C(9, 3) + C(9, 4) + C(9, 5) + C(9, 6) + C(9, 7) + C(9, 8) + C(9, 9) \\ &= 2^9 - C(9, 0) - C(9, 1) - C(9, 2) = 512 - 1 - 9 - 36 = 466 \end{aligned}$$