UNIVERSITY OF WATERLOO

University of Waterloo
Faculty of Mathematics

Centre for Education in
Mathematics and Computing

Grade 7/8 Math Circles

Fall 2012

Probability

Solutions

1. {M, A, T, H, E, I, C, S}

2. {1H, 1T, 2H, 2T, 3H, 3T, 4H, 4T, 5H, 5T, 6H, 6T}

3. $P(5) = \frac{4}{52} = \frac{1}{13}$

4. (a) $P(\text{blue}) = \frac{7}{15}$

   (b) $P(\text{not red}) = \frac{12}{15} = \frac{4}{5}$

   (c) $P(\text{red or green}) = \frac{8}{15}$

5. (a) $P(\text{even}) = \frac{3}{6} = \frac{1}{2}$

   (b) $P(\text{odd}) = \frac{3}{6} = \frac{1}{2}$

6. $P(\text{odd}) = \frac{4}{7}$

7. $P(\text{face}) = \frac{12}{52} = \frac{3}{13}$

8. (a) $P(\text{prime}) = \frac{8}{20} = \frac{2}{5}$

   (b) $P(\text{single digit}) = \frac{9}{20}$

   (c) $P(\text{contains 1}) = \frac{11}{20}$

9. (a) $P(>5) = \frac{26}{36} = \frac{13}{18}$

(b) $P(<2) = \frac{0}{36} = 0$

(c) $P(= 8) = \frac{5}{36}$

(d) $P(\leqslant 12) = \frac{36}{36} = 1$

(e) $P(\geqslant 4) = \frac{33}{36} = \frac{11}{12}$

10. (a) $P(J\diamondsuit \text{ AND } 5\clubsuit) = \frac{1}{52} \times \frac{1}{52} = \frac{1}{2704}$

(b) $P(J \text{ AND } 5) = \frac{4}{52} \times \frac{4}{52} = \frac{1}{13} \times \frac{1}{13} = \frac{1}{169}$

(c) $P(10 \text{ AND } 3\spadesuit) = \frac{4}{52} \times \frac{1}{52} = \frac{1}{13} \times \frac{1}{52} = \frac{1}{676}$

(d) $P(8\heartsuit \text{ AND } 8\heartsuit) = \frac{1}{52} \times \frac{1}{52} = \frac{1}{2704}$

(e) $P(\textit{any} \text{ AND } \textit{same}) = \frac{52}{52} \times \frac{1}{52} = \frac{1}{52}$

11. (a) $P(\textit{even} \text{ AND } >3) = \frac{3}{6} \times \frac{3}{6} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

(b) $P(6 \text{ AND } 2) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

(c) $P(\textit{any} \text{ AND } \textit{odd}) = \frac{6}{6} \times \frac{3}{6} = \frac{1}{2}$

12. (a) $P(\text{at least } 3) = \binom{5}{3}(0.35)^3 = 0.43$

(b) $P(\text{exactly } 3) = \binom{5}{3}(0.35)^3(0.65)^2 = 0.18$

(c) $P(\text{at most } 2) = 1 - P(\text{at least } 3) = 1 - \binom{5}{3}(0.35)^3 = 1 - 0.43 = 0.57$

13. Note: When two events are not mutually exclusive, we use the formula:

$P(\text{A OR B}) = P(\text{A}) + P(\text{B}) - P(\text{A AND B})$

Let event A be playing hockey and let event B be playing baseball.

Then, $P(\text{A OR B}) = 0.79$, $P(\text{A AND B}) = 0.15$ and $P(\text{A}) = 0.6$.

So, using the formula and rearranging it to find $P(\text{B})$, we get:

$P(\text{B}) = P(\text{A OR B}) - P(\text{A}) + P(\text{A AND B})$

$P(\text{B}) = 0.79 - 0.6 + 0.15$

$P(\text{B}) = 0.34$