

## Probabilities Using Listings

### Starter

1. (a) A couple have three children. What are the different orders of having boys and girls? (**Hint:** you may wish to consider 2 children first).
- (b) Given that it is equally likely whether the couple have a boy or a girl, find the probability of:
- (i) having 3 girls
  - (ii) having 1 boy
  - (ii) having at least 1 girl

### Working:

- (a) 2 children: BB BG GB GG  
For each these orders there could be a B or a G in front.  
For BB: BBB GBB  
For BG: BBG GBG  
For GB: BGB GGB  
For GG: BGG GGG

- (b) There are 8 equally likely outcomes.

(i)  $P(3 \text{ girls}) = \frac{1}{8}$

(ii)  $P(1 \text{ boy}) = \frac{3}{8}$       **BGG BGB GGB**

(iii)  $P(\text{at least 1 girl}) = \frac{7}{8}$

or  $P(\text{at least 1 girl}) = 1 - P(\text{no girls}) = 1 - \frac{1}{8} = \frac{7}{8}$

**E.g. 1** Two dice are rolled and the difference between the numbers is found.

- (a) Copy and complete the probability space diagram to represent the possible outcomes

Diff	1	2	3	4	5	6
1		1				
2					3	
3						
4				0		
5	4					
6						

Use your table to find the probability of getting a difference of:

- (b) 0  
 (c) 2 or 3  
 (d) greater than zero

**Working:** (a)

Diff	1	2	3	4	5	6
1	0	1	2	3	4	5
2	1	0	1	2	3	4
3	2	1	0	1	2	3
4	3	2	1	0	1	2
5	4	3	2	1	0	1
6	5	4	3	2	1	0

- (b) There are 6 zeros in the table  
 There are 36 possible outcomes

$$P(0) = \frac{6}{36} = \frac{1}{6}$$

(c)  $P(2 \text{ or } 3) = \frac{14}{36} = \frac{7}{18}$

(d)  $P(> 0) = 1 - P(0) = 1 - \frac{1}{6} = \frac{5}{6}$

**N.B.** Make sure you use correct notation and cancel fractions where possible.

**E.g. 2** Spinner A has the numbers  $-1, 0, 2$  and  $5$  on it  
 Spinner B has the numbers  $-3, -2, 1$  and  $4$  on it.  
 The two spinners are spun and the sum of the numbers found.

(a) Draw a sample space diagram with the possible outcomes.

Sum	$-1$	$0$	$2$	$5$
$-3$	$-4$			
$-2$				$3$
$1$			$3$	
$4$		$4$		

Find the probability of getting a total of:

- (b)  $1$  (c)  $3$  (d) less than  $5$   
 (e) more than  $6$  (f) at least  $2$   
 (g) a  $2$  on one spinner and  $-3$  on the other (h) a negative total

**Working:** (a)

Sum	$-1$	$0$	$2$	$5$
$-3$	$-4$	$-3$	$-1$	$2$
$-2$	$-3$	$-2$	$0$	$3$
$1$	$0$	$1$	$3$	$6$
$4$	$3$	$4$	$6$	$9$

- (b) There is one  $1$  in the table.  
 There are  $16$  possible outcomes.  

$$P(1) = \frac{1}{16}$$
- (c) 
$$P(3) = \frac{3}{16}$$
- (d) 
$$P(< 5) = \frac{13}{16}$$
- (e) 
$$P(> 6) = \frac{1}{16}$$
- (f) 
$$P(\geq 2) = \frac{8}{16} = \frac{1}{2}$$
- (g) 
$$P(\text{a } 2 \text{ on one spinner and } -3 \text{ on the other}) = \frac{1}{16}$$
- (h) 
$$P(\text{a negative total}) = \frac{5}{16}$$

**Video:** [Sample space diagrams](#)

[Solutions to Starter and E.g.s](#)

**Exercise**

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