

TOO MANY BOYS? - SOLUTIONS



TASK A

Let G be the event a baby is born a girl.

Let B be the event a baby is born a boy.

1. $P(B) = 0.5$

2. No

3. $P(B \text{ and } B) = 0.5 \times 0.5 = 0.25$

4. $P(B \text{ and } B) = 0.25$ (from question 3)

The probability of having a boy and girl can happen in two ways.

$$P(B \text{ and } G) + P(G \text{ and } B) = 0.5 \times 0.5 + 0.5 \times 0.5 = 0.25 + 0.25 = 0.5$$

Therefore it is less likely they will have 2 boys rather than a girl and a boy.

5.

a) $P(B \text{ and } B \text{ and } B) = 0.5 \times 0.5 \times 0.5 = 0.125 = 0.13$ 2 sf

b) $P(B \text{ and } B \text{ and } G) + P(B \text{ and } G \text{ and } B) + P(G \text{ and } B \text{ and } B) = 3(0.5 \times 0.5 \times 0.5) = 0.38$ 2 sf

c) $P(B \text{ and } G \text{ and } G) + P(G \text{ and } G \text{ and } B) + P(G \text{ and } B \text{ and } G) = 3(0.5 \times 0.5 \times 0.5) = 0.38$ 2 sf

d) $P(G \text{ and } G \text{ and } G) = (0.5 \times 0.5 \times 0.5) = 0.13$ 2 sf

6. $P(B \text{ and } B \text{ and } B \text{ and } B \text{ and } B \text{ and } B \text{ and } B \text{ and } B) = 0.0039$ 2 sf

7. $P(B \text{ and } B \text{ and } B) = 0.13$ 2 sf (from question 5 a)

$$P(B \text{ and } B \text{ and } B \text{ and } G) + P(B \text{ and } B \text{ and } G \text{ and } B) + P(B \text{ and } G \text{ and } B \text{ and } B) + P(G \text{ and } B \text{ and } B \text{ and } B) \\ = 4 \times 0.5^4 = 0.25$$

TASK B

8. $P(2 \text{ boys given they plan to have 2 children}) = P(B \cap B | 2 \text{ children})$

$$= \frac{6280}{27782} = 0.23 \text{ 2sf}$$

9. If a couple plan to have 3 children what are the probabilities that they will have:

a) $P(3 \text{ boys given they plan to have 3 children})$

b) $P(2 \text{ boys and 1 girl given they plan to have 3 children})$

$$= \frac{5275}{14264} = 0.37 \text{ 2 sf}$$

c) $P(1 \text{ boy and 2 girls given they plan to have 3 children})$

$$= \frac{5266}{14264} = 0.37 \text{ 2 sf}$$

d) $P(3 \text{ girls given they plan to have 3 children})$

$$= \frac{1788}{14264} = 0.13 \text{ 2 sf}$$