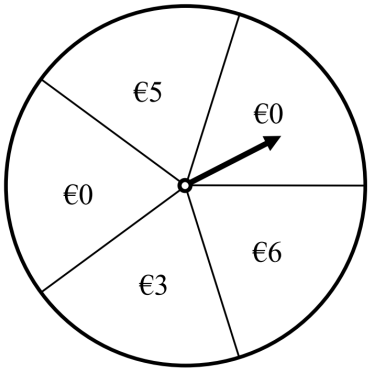
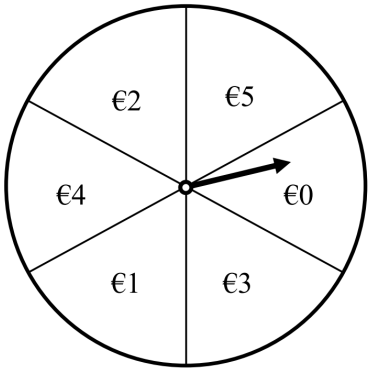
Question 3 **(25 marks)**

Two different games of chance, shown below, can be played at a charity fundraiser. In each game, the player spins an arrow on a wheel and wins the amount shown on the sector that the arrow stops in. Each game is fair in that the arrow is just as likely to stop in one sector as in any other sector on that wheel.



Game *A*



Game *B*

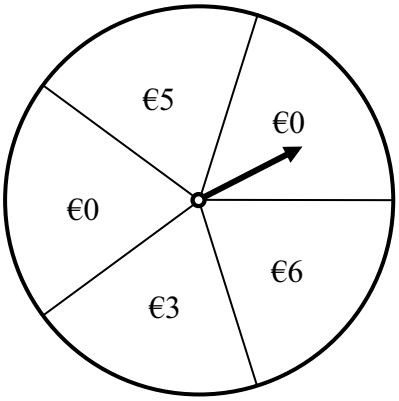
(a) John played Game *A* four times and tells us that he has won a total of €8. In how many different ways could he have done this?

(b) To spin either arrow once, the player pays €3. Which game of chance would you expect to be more successful in raising funds for the charity? Give a reason for your answer.

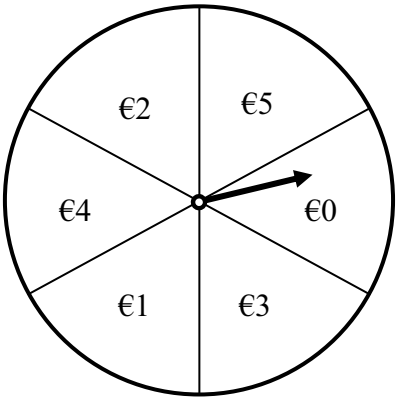
(c) Mary plays Game *B* six times. Find the probability that the arrow stops in the €4 sector exactly twice.

Question 3 **(25 marks)**

Two different games of chance, shown below, can be played at a charity fundraiser. In each game, the player spins an arrow on a wheel and wins the amount shown on the sector that the arrow stops in. Each game is fair in that the arrow is just as likely to stop in one sector as in any other sector on that wheel.



Game *A*



Game *B*

(a) John played Game *A* four times and tells us that he has won a total of €8. In how many different ways could he have done this?

5, 3, 0, 0;	3, 5, 0, 0;	0, 5, 3, 0;	0, 3, 5, 0;	
5, 0, 3, 0;	3, 0, 5, 0;	0, 5, 0, 3;	0, 3, 0, 5;	12 ways
5, 0, 0, 3;	3, 0, 0, 5;	0, 0, 5, 3;	0, 0, 3, 5.	

(b) To spin either arrow once, the player pays €3. Which game of chance would you expect to be more successful in raising funds for the charity? Give a reason for your answer.

Expected outcome $E(X) = \sum x.P(x)$

Game *A*: $E(X) = 0\left(\frac{2}{5}\right) + 3\left(\frac{1}{5}\right) + 5\left(\frac{1}{5}\right) + 6\left(\frac{1}{5}\right) = 2\frac{4}{5}$

Game *B*: $E(X) = 0\left(\frac{1}{6}\right) + 1\left(\frac{1}{6}\right) + 2\left(\frac{1}{6}\right) + 3\left(\frac{1}{6}\right) + 4\left(\frac{1}{6}\right) + 5\left(\frac{1}{6}\right) = 2\frac{3}{6} = 2\frac{1}{2}$

Game *B* - it pays out less money.

Or

On average, over the long term:
Game *A* pays out €14 for every €15 taken in.
Game *B* pays out €15 for every €18 taken in.
Game *B* – it pays out a smaller proportion on the money taken in.

(c) Mary plays Game *B* six times. Find the probability that the arrow stops in the €4 sector exactly twice.

$$\text{P(stops in €4 sector exactly twice)} = \binom{6}{2}\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^4 = 0\cdot 2$$

Question 3 **(25 marks)**

(a) Scale 10C (0, 3, 7, 10)

Low Partial Credit:

- Some reference to €3 and €5

High Partial Credit

- Listing with not more than five omitted

(b) Scale 5C (0, 2, 3, 5)

Low Partial Credit

- One partially accurate statement
- Expected outcome formula

High Partial Credit

- Correct answer but inaccurate / only partially correct supporting evidence
- Expected outcome of both Game A and Game B calculated but incorrect or no conclusion.

(c) Scale 10C (0, 3, 7, 10)

Low Partial Credit:

- Establishes probability of stopping on €4 sector once
- Establishes probability of not stopping on €4 sector once
- Effort to express a relevant binomial expansion

High Partial Credit

- Omits $\binom{6}{2}$
- Indices incorrectly assigned