7.3 Answers

Additional Mathematics
A-Level Pure Mathematics : Year 1
Binomial Expansion

Answer 1

(i)

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1

[1 mark]

(ii) ${}^{7}C_{5} = 21$

[1 mark]

Answer 2

(i), **(ii)** and **(iii)**

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1

[1, 1, 1 marks]

(iv) ${}^{8}C_{4} = 70$ (Other answers are possible)

[1 mark]

Answer 3

${}^{13}C_{5} = 1287$

[1 mark]

Answer 4

(i) $^{6}C_{2} = 15$

(ii)

1						
1	1					
1	2	1				
1	3	3	1			
1	4	6	4	1		
1	5	10	10	5	1	
1	6	15	20	15	6	1

[1, 1, 2 marks]

Answer 5

$^{20}C_{13} = 77\,520$

[2 marks]

Answer 6

$^{40}C_{5} = 658\,008$

[2 marks]

Answer 7

$^{8}C_{3} \times 0.45^{3} \times 0.55^{5} = 0.257$

[4 marks]

Answer 8

$^{180}C_{2} \times 0.99^{178} \times 0.01^{2} = 0.269$

That is, 26.9%

[4 marks]

Answer 9

(i) 3

[1 mark]

(ii) $^{24}C_3 \times \left(\frac{1}{8}\right)^3 \times \left(\frac{7}{8}\right)^{21} = 0.239$

[4 marks]

(iii) $^{24}C_2 \times \left(\frac{1}{8}\right)^2 \times \left(\frac{7}{8}\right)^{22}$

$+ \ ^{24}C_1 \times \left(\frac{1}{8}\right)^1 \times \left(\frac{7}{8}\right)^{23}$

$+ \ ^{24}C_0 \times \left(\frac{1}{8}\right)^0 \times \left(\frac{7}{8}\right)^{24}$

$= 0.229 + 0.139 + 0.041 = 0.409$

[4 marks]

(iv) 0.352

[1 mark]

(v) The “very large box” means that the probability of getting any given colour remains constant as Smarties™ are taken out of the box and eaten. Yum !

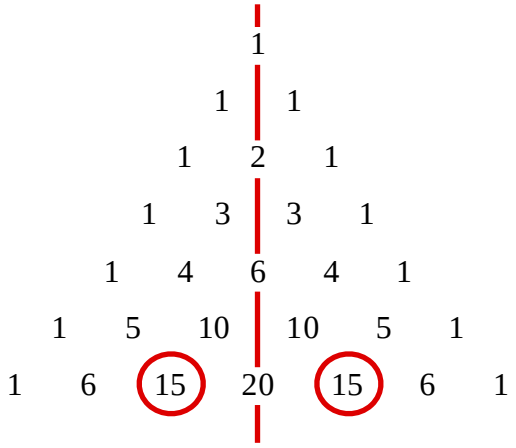
[2 marks]

Answer 10

(i) and **(ii)** $^6C_2 = \ ^6C_4 = 15$

[1, 1 mark]

(iii) Pascal's triangle is symmetrical about the central coefficients



[2 marks]

(iv) $^nC_0$ (which is the left outside edge) $= \ ^nC_n$ (which is the right outside edge)

[2 marks]

(v) $^nC_2$ (Δ-number in column 1) $= \ ^nC_{n-2}$ (Δ-number in column $n - 1$)

[2 marks]

(vi) $^nC_m = \ ^nC_{n-m}$ for $m \leqslant n$

[2 marks]

Answer 11

(i)

$$P(4 \text{ tails}) = {}^{6}C_4 \times 0.4^4 \times (1 - 0.4)^{6-4}$$
$$= 15 \times 0.4^4 \times 0.6^2$$
$$= 0.138 \quad \text{i.e. About } 14\% \quad \square$$

[2 marks]

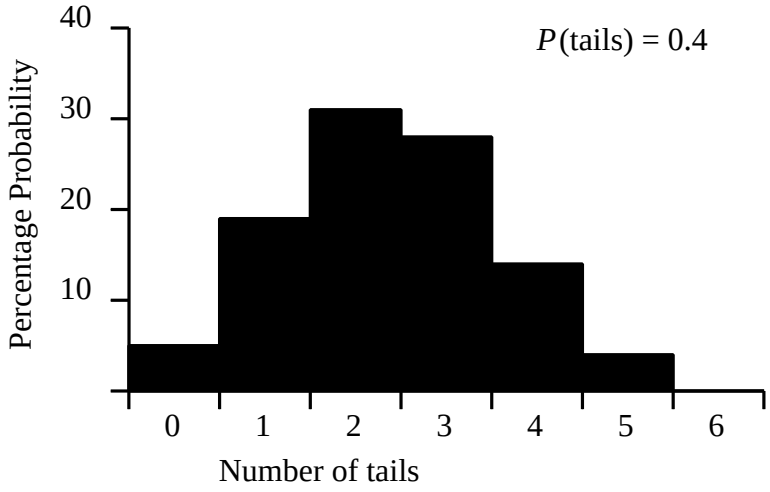
(ii)

N° of tails	0	1	2	3	4	5	6
Probability	5%	19%	31%	28%	14%	4%	0%

Rounding errors mean we've got 101% but as the table is being used to produce a bar chart, let's not worry about it !

[8 marks]

(iii)



[6 marks]