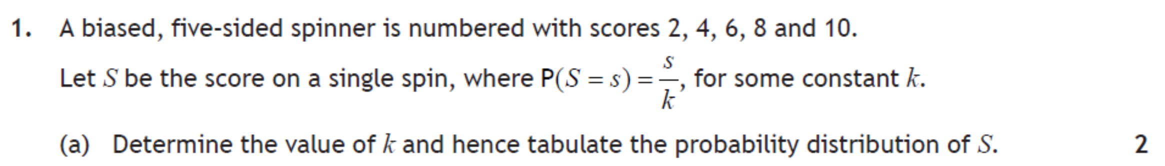
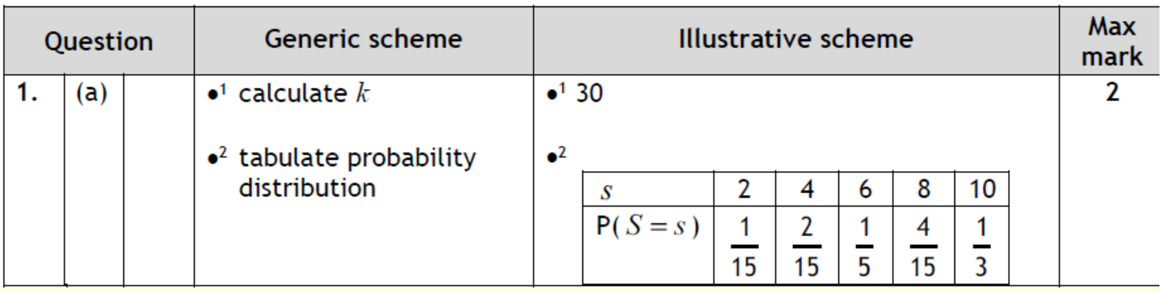
Starter



1. A biased, five-sided spinner is numbered with scores 2, 4, 6, 8 and 10.

Let S be the score on a single spin, where $P(S = s) = \frac{s}{k}$, for some constant k.

(a) Determine the value of k and hence tabulate the probability distribution of S. 2



<table>
<tr><th colspan="3">Question</th><th>Generic scheme</th><th>Illustrative scheme</th><th>Max mark</th></tr>
<tr><td>1.</td><td>(a)</td><td></td><td>•¹ calculate k
•² tabulate probability distribution</td><td>•¹ 30
•²<table><tr><td>s</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td></tr><tr><td>$P(S = s)$</td><td>$\frac{1}{15}$</td><td>$\frac{2}{15}$</td><td>$\frac{1}{5}$</td><td>$\frac{4}{15}$</td><td>$\frac{1}{3}$</td></tr></table></td><td>2</td></tr>
</table>

Mean & Variance

Today we are learning...

How to calculate the mean and variance of a random variable.

I will know if I have been successful if...

I can tabulate the probability distribution of a random variable.

I can find the E(X) and E(X^2)

I can find the Var(X)

Mean & Variance

The mean (denoted μ or E(X)) of the discrete random variable X is the average value that would be recorded in if an experiment was carried out.

$$\mu = E(X) = \sum_{\text{all } x} x\, p(x)$$

Calculate E(Y) for the sum of two dice.

What would we expect the sum of two dice to be?

Aug 8-5:18 PM

Mean & Variance

The variance, V(X), of a discrete random variable is a measure of how spread out the recorded values of X would be if the experiment were carried out a large number of times.

$$V(X) = E(X^2) - ((E(X)^2)$$

$$\text{where } E(X^2) = \sum_{\text{all } x} x^2\, p(x)$$

Calculate the V(Y) for the sum of the two dice.

Aug 8-5:22 PM

Page 34 - Exercise 2.1A

Page 36 - Exercise 2.1B

Aug 8-5:28 PM

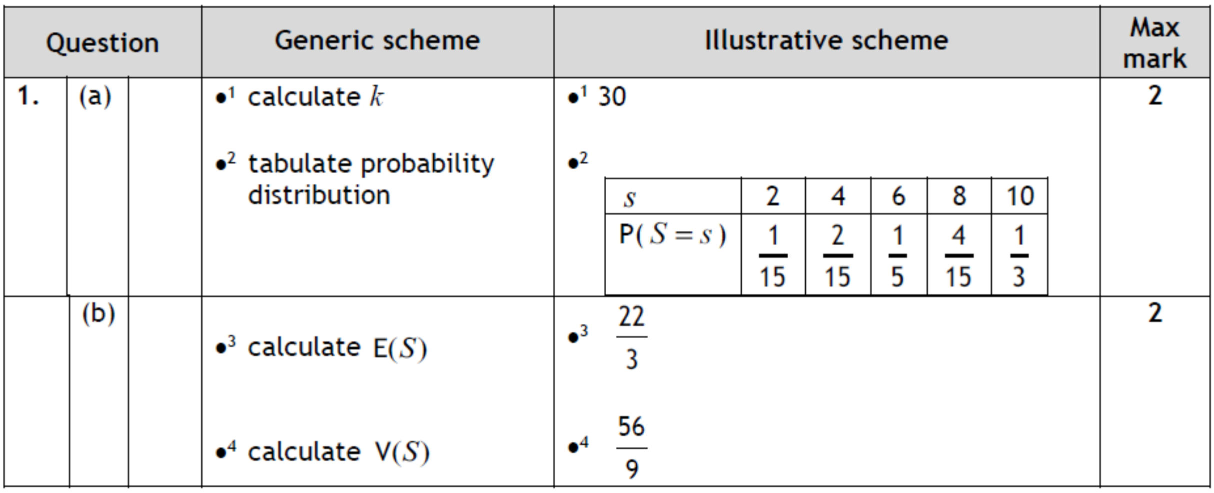
1. A biased, five-sided spinner is numbered with scores 2, 4, 6, 8 and 10.

   Let S be the score on a single spin, where $P(S = s) = \frac{s}{k}$, for some constant k.

   (a) Determine the value of k and hence tabulate the probability distribution of S. 2

   (b) Calculate $E(S)$ and $V(S)$. 2

Jun 18-10:01



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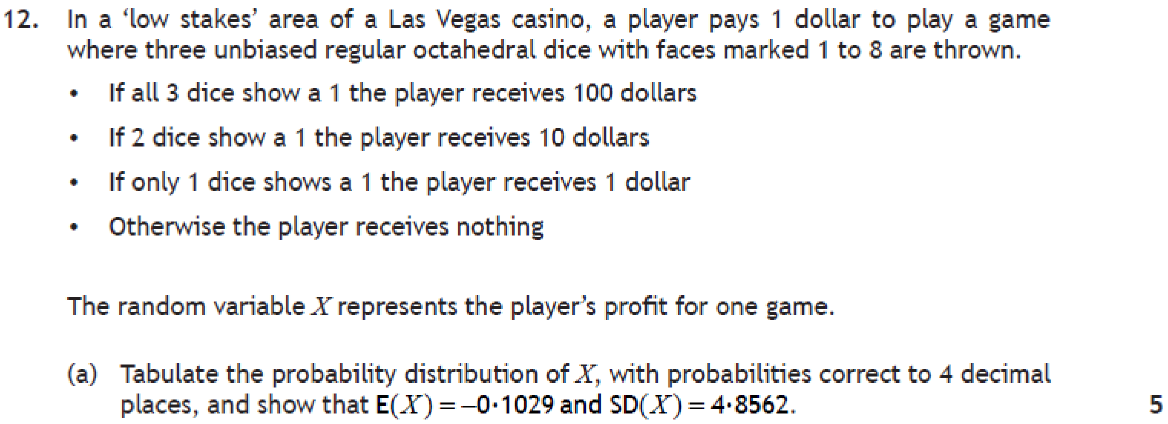
<tr><td></td><td>(b)</td><td></td><td>•³ calculate $E(S)$
•⁴ calculate $V(S)$</td><td>•³ $\frac{22}{3}$
•⁴ $\frac{56}{9}$</td><td>2</td></tr>
</table>

Jun 18-10:02



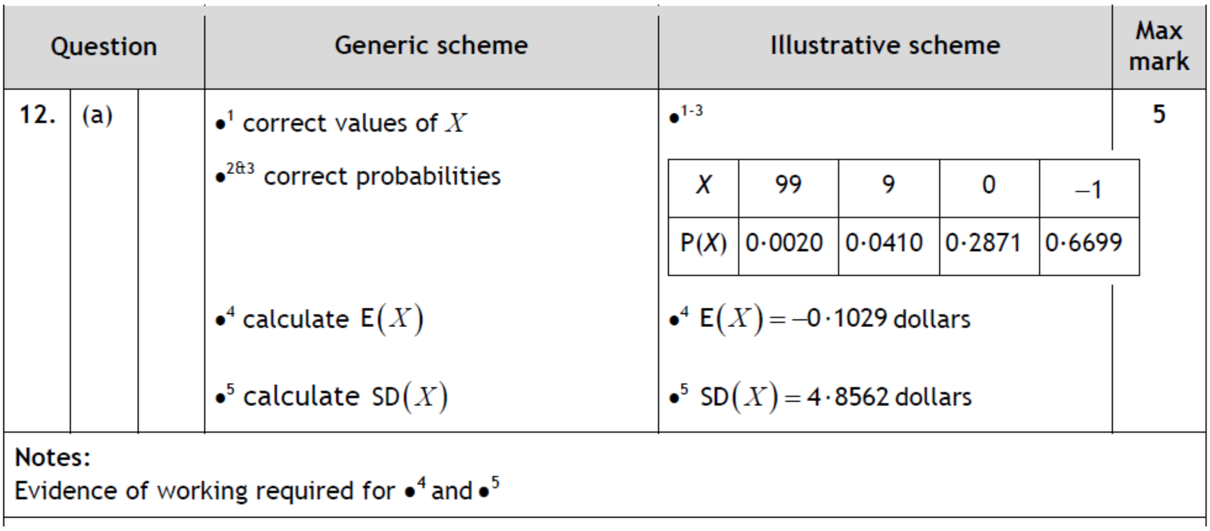
12. In a 'low stakes' area of a Las Vegas casino, a player pays 1 dollar to play a game where three unbiased regular octahedral dice with faces marked 1 to 8 are thrown.

- If all 3 dice show a 1 the player receives 100 dollars
- If 2 dice show a 1 the player receives 10 dollars
- If only 1 dice shows a 1 the player receives 1 dollar
- Otherwise the player receives nothing

The random variable X represents the player's profit for one game.

(a) Tabulate the probability distribution of X, with probabilities correct to 4 decimal places, and show that $E(X) = -0{\cdot}1029$ and $SD(X) = 4{\cdot}8562$. 5

Jun 18-10:05



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<tr><td>12.</td><td>(a)</td><td></td><td>•[1] correct values of X
•[2&3] correct probabilities</td><td>•[1-3]<table><tr><td>X</td><td>99</td><td>9</td><td>0</td><td>-1</td></tr><tr><td>P(X)</td><td>0·0020</td><td>0·0410</td><td>0·2871</td><td>0·6699</td></tr></table></td><td>5</td></tr>
<tr><td></td><td></td><td></td><td>•[4] calculate $\mathrm{E}(X)$</td><td>•[4] $\mathrm{E}(X) = -0\cdot1029$ dollars</td><td></td></tr>
<tr><td></td><td></td><td></td><td>•[5] calculate $\mathrm{SD}(X)$</td><td>•[5] $\mathrm{SD}(X) = 4\cdot8562$ dollars</td><td></td></tr>
<tr><td colspan="6">**Notes:**
Evidence of working required for •[4] and •[5]</td></tr>
</table>

Jun 18-10:06