

1: The discrete random variable X has probability distribution

x	1	2	3	4
$P(X=x)$	0.3	0.2	0.35	0.15

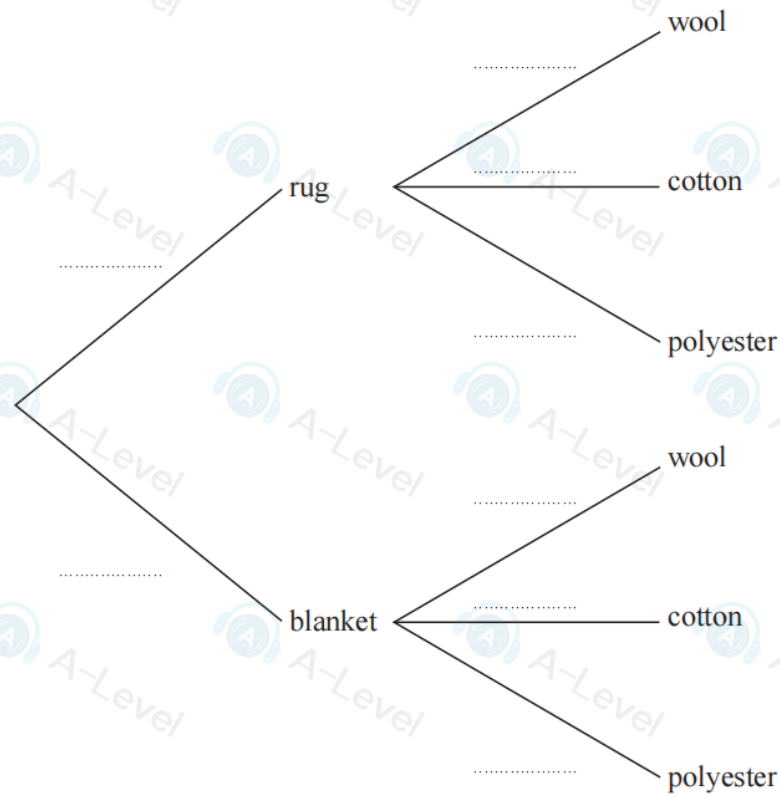
- (a) Find $F(3.5)$ (1)
- (b) Find $P(3X - 3 < X + 2)$ (2)
- (c) Find $E(X)$ (2)
- (d) Show that $\text{Var}(X) = 1.1275$ (3)
- (e) Find $\text{Var}(5 - 2X)$ (1)

3. A factory makes rugs and blankets from wool **or** cotton **or** polyester.

- 30% of the items made are rugs and 70% of the items made are blankets
- 60% of the rugs are made from wool
- 35% of the blankets are made from wool
- 10% of the rugs are made from cotton
- 20% of the blankets are made from cotton
- the rest of the rugs and blankets are made from polyester

An item made by the factory is selected at random.

(a) Complete the tree diagram below to illustrate this information.



(2)

(b) (i) Find the probability that the item selected is **not** made from wool.

(2)

(ii) Given that this item is **not** made from wool, find the probability that it is a blanket.

(2)

2. The discrete random variable X has the following probability distribution.

x	-2	-1	0	1	3
$P(X = x)$	0.15	a	b	a	0.4

(a) Find $E(X)$.

(2)

Given that $E(X^2) = 4.54$

(b) find the value of a and the value of b .

(5)

The random variable $Y = 3 - 2X$

(c) Find $\text{Var}(Y)$.

(3)

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6. A biased die with six faces is rolled. The discrete random variable X represents the score which is uppermost. The **cumulative** distribution function of X is shown in the table below.

x	1	2	3	4	5	6
$F(x)$	0.1	0.2	$3k$	$5k$	$7k$	$10k$

- (a) Find the value of the constant k (1)
- (b) Find the probability distribution of X (3)

A biased die with eight faces is rolled. The discrete random variable Y represents the score which is uppermost. The probability distribution of Y is shown in the table below, where a and b are constants.

y	1	2	3	4	5	6	7	8
$P(Y = y)$	a	a	a	b	b	b	0.11	0.05

Given that $E(Y) = 4.02$

- (c) form and solve two equations in a and b to show that $a = 0.15$
You must show your working.

(Solutions relying on calculator technology are not acceptable.)

- (d) Show that $E(Y^2) = 20.7$ (2)
- (e) Find $\text{Var}(5 - 2Y)$ (3)

These dice are each rolled once. The scores on the two dice are independent.

- (f) Find the probability that the sum of these two scores is 3 (2)