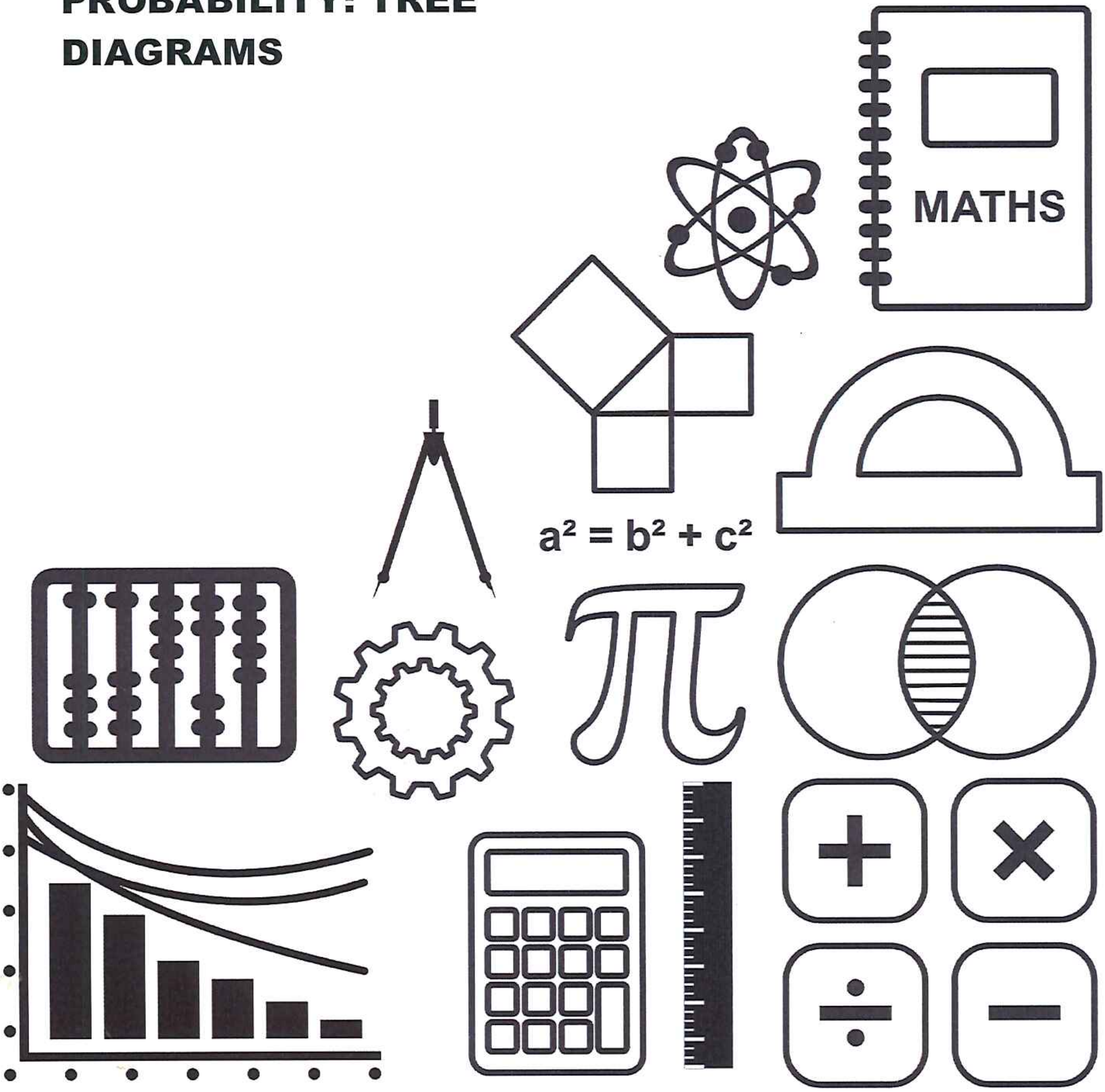
MATHSDIY

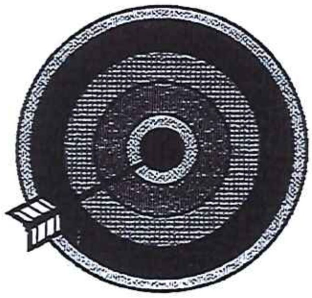
SOLUTIONS

GCSE TOPIC BOOKLET PROBABILITY: TREE DIAGRAMS



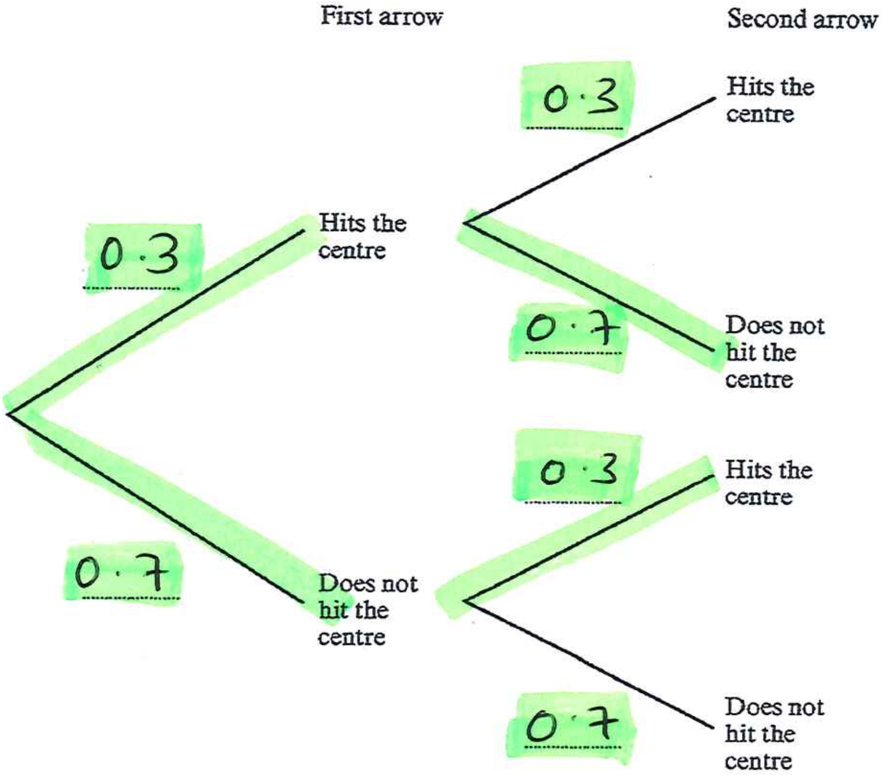
1.

Each time George fires an arrow at a target, the probability that it hits the centre of the target is 0·3.



George fires two arrows at the target.

(a) Complete the following probability tree diagram.



[2]

(b) Calculate the probability that George only hits the centre of the target once.

P(Hits only once) = P(Hits then misses) × P(misses then hits)

$= (0{\cdot}3 \times 0{\cdot}7) + (0{\cdot}7 \times 0{\cdot}3)$

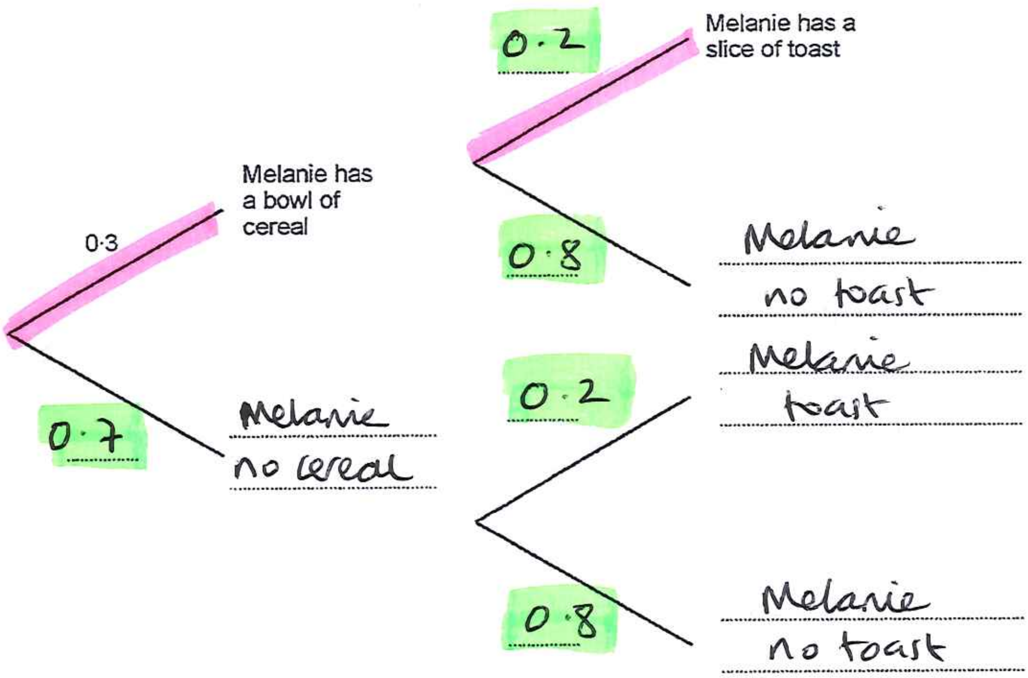
$= \underline{0{\cdot}42}$

[3]

2.

At breakfast, the probability that Melanie has a bowl of cereal is 0·3 and the probability that Melanie has a slice of toast is 0·2.
Melanie having a bowl of cereal and Melanie having a slice of toast are independent events.

(a) Complete the tree diagram. [3]



(b) Find the probability that Melanie has a bowl of cereal and a slice of toast. [2]

$P(\text{cereal and toast}) = P(\text{cereal}) \times P(\text{toast})$

$= 0 \cdot 3 \times 0 \cdot 2$

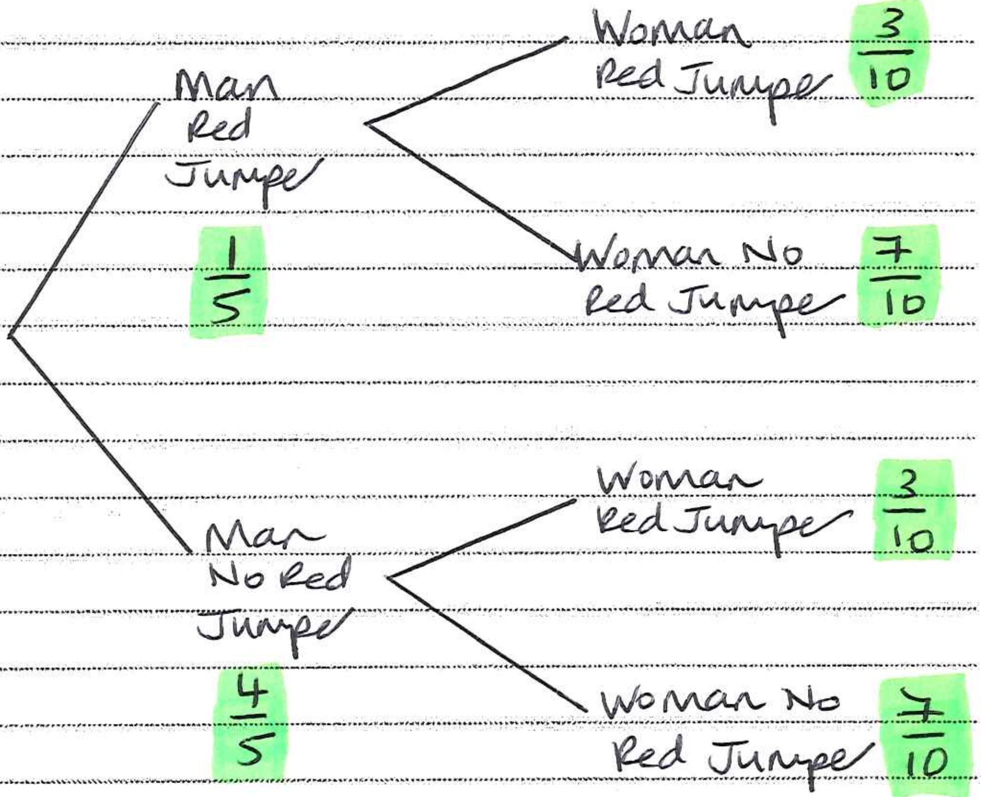
$= \underline{\underline{0 \cdot 06}}$

3.

In a group of 15 people there are 5 men and 10 women.
One of the men and three of the women are wearing red jumpers.
A man is selected at random from the group.
Then a woman is selected at random from the group.

Is the probability that the people selected are both wearing red jumpers greater or less than 5%?
You must show your working and give a reason for your answer.

[5]



P(both wearing red jumpers)

= P(man red jumper) × P(woman red jumper)

$= \frac{1}{5} \times \frac{3}{10} = \frac{3}{50} = \frac{6}{100} = 6\%$

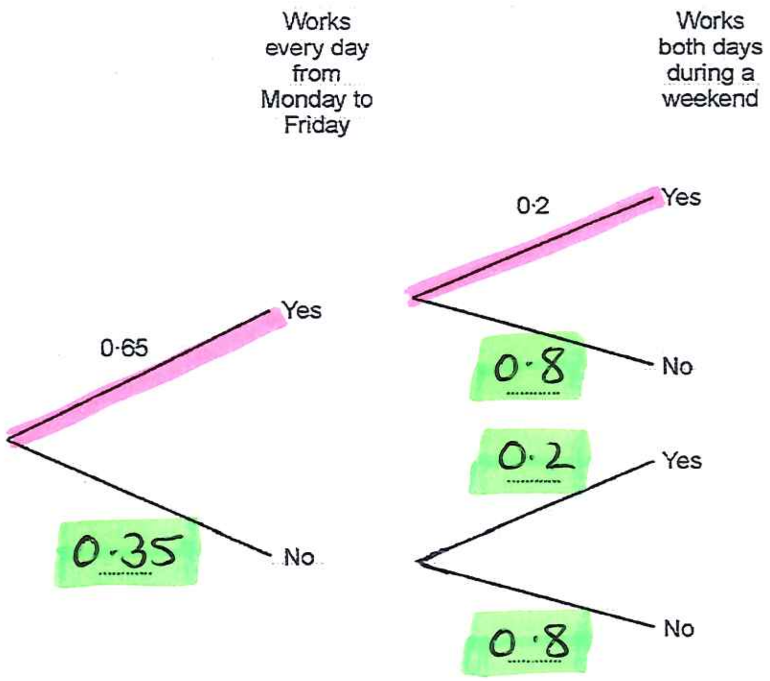
Yes, the probability that the people selected will both be wearing red jumpers is greater than 5%, because 6% > 5%.

4.

Carys has a Monday to Friday job and a weekend job.
Working Monday to Friday and working weekends are independent events.

In any given week, the probability that Carys works every day from Monday to Friday is 0·65.
The probability that she works both days during a weekend is 0·2.

(a) Complete the following tree diagram. [2]



(b) Calculate the probability that next week Carys will work every day from **Monday to Sunday.** [2]

$= P(\text{every day Monday to Friday}) \times P(\text{both days during weekend})$

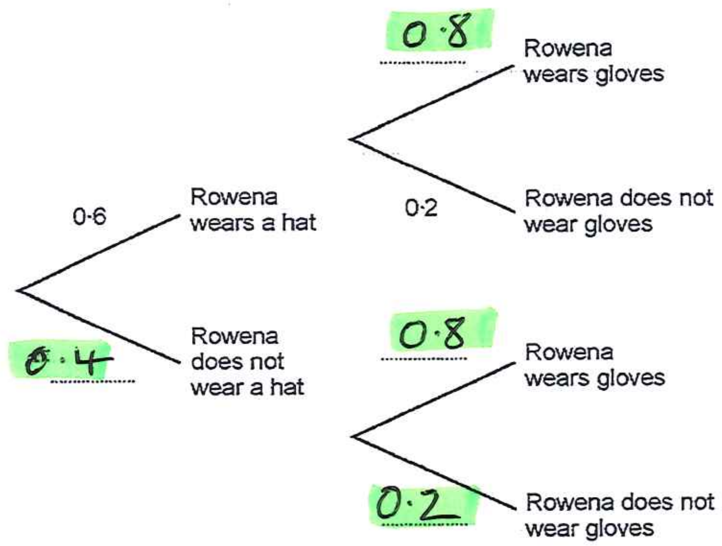
$= 0\cdot65 \times 0\cdot2$

$= \underline{\underline{0\cdot13}}$

5. Rowena sometimes wears a hat and sometimes wears gloves.

The probability that she wears a hat on a given day is 0·6.
The probability that she **does not** wear gloves on a given day is 0·2.
Wearing a hat and wearing gloves are independent.

(a) Complete the following tree diagram. [2]



(b) Calculate the probability that, on a given day, Rowena wears a hat but does not wear gloves. [2]

$= P(\text{hat}) \times P(\text{no gloves})$

$= 0\cdot6 \times 0\cdot2$

$= \underline{\underline{0\cdot12}}$

(c) Calculate the probability that, on a given day, Rowena **does not** wear a hat or gloves. [2]

$P(\text{no hat}) \times P(\text{no gloves})$

$= 0\cdot4 \times 0\cdot2$

$= \underline{\underline{0\cdot08}}$

6. The probability that Daisy wears a bracelet is 0·7.
The probability that Daisy wears a bracelet **and** wears a necklace is 0·63.
For Daisy, wearing a bracelet and wearing a necklace are independent events.

(a) (i) Find the probability that Daisy wears a necklace. [2]

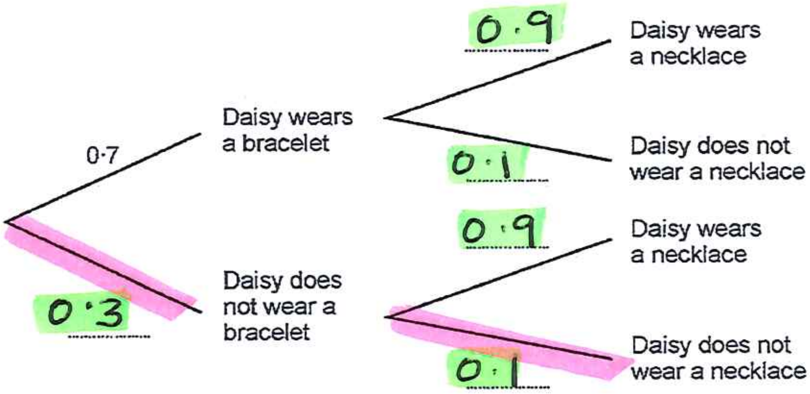
P(necklace) × P(bracelet) = 0·63

P(necklace) × 0·7 = 0·63

P(necklace) = 0·63 / 0·7 = 0·9

Probability that Daisy wears a necklace = 0·9

(ii) Complete the tree diagram. [2]



(b) Find the probability that Daisy does not wear a bracelet **and** does not wear a necklace. [2]

P(no bracelet) × P(no necklace)

= 0·3 × 0·1

= 0·03

7. Alwyn often drives from Bangor to Cardiff.
He always chooses one of two routes for these journeys.
He either travels through Rhayader or through Hereford.
The probability that he travels through Rhayader is 0·7.

Sometimes he decides to stop for a break during his journey.
His decision is independent of the route he takes.

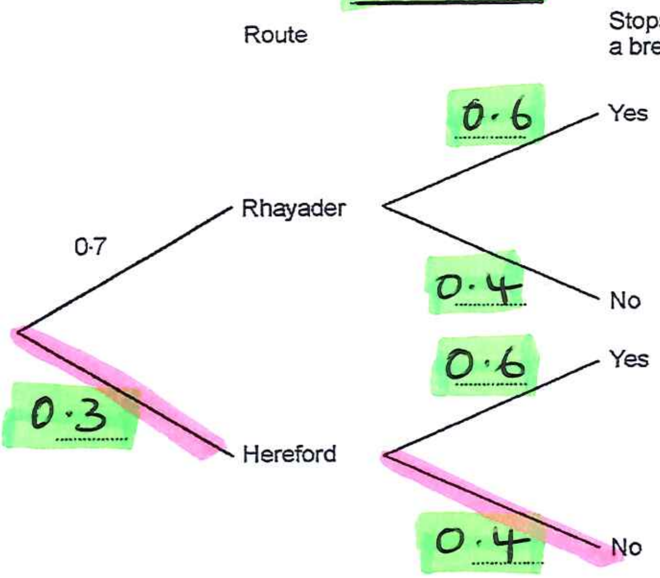
The probability that he travels through Rhayader **and** stops for a break is 0·42.

(a) Complete the following tree diagram. [4]

$P(\text{Rhayade}) \times P(\text{break}) = 0 \cdot 42$

$0 \cdot 7 \times P(\text{break}) = 0 \cdot 42$

$\underline{\underline{P(\text{break})}} = 0 \cdot 42 \div 0 \cdot 7 = \underline{\underline{0 \cdot 6}}$



(b) Calculate the probability that Alwyn travels through Hereford but **does not** stop for a break. [2]

$= P(\text{Hereford}) \times P(\text{No break})$

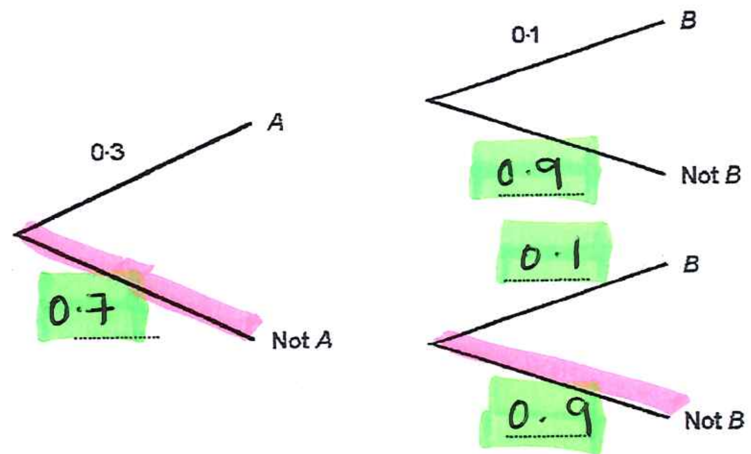
$= 0 \cdot 3 \times 0 \cdot 4$

$= \underline{\underline{0 \cdot 12}}$

8.

A and B are independent events.
$P(A) = 0{\cdot}3$ and $P(B) = 0{\cdot}1$

(a) Complete the tree diagram. [2]



(b) Calculate the probability of neither event A nor event B occurring. [2]

$= P(\text{not } A) \times P(\text{not } B)$

$= 0{\cdot}7 \times 0{\cdot}9 = \underline{\underline{0{\cdot}63}}$

9.

Each of the numbers 2, 3, 4, 5, 5 and 6 is written on a card.

2	3	4	5	5	6

Two of the six cards are selected at random, without being replaced.

Find the probability that the **sum** of the numbers on the two cards is less than 11. [3]

Realise that to get 11 you need a 5 and a 6.

$\therefore P(\text{sum of } 11)$

$= P(5) \times P(6) + P(6) \times P(5)$

$= \left(\frac{2}{6} \times \frac{1}{5}\right) + \left(\frac{1}{6} \times \frac{2}{5}\right) = \frac{2}{30} + \frac{2}{30} = \underline{\underline{\frac{4}{30}}}$

$P(\text{sum less than } 11) = 1 - P(\text{sum of } 11)$

$= 1 - \frac{4}{30}$

$= \underline{\underline{\frac{26}{30}}} \quad \left(\frac{13}{15}\right)$