

Mutually exclusive and exhaustive outcomes

Year 7 About 60 minutes No calculator 46 marks



Hints online, answers free with an account:

mathswariz.uk/worksheets/ks3-year-7-mutually-exclusive-and-exhaustive-outcomes/

Date _____

A Do Now

Quick questions to start.

A1 Needed today [1 mark]
Work out $1 - \frac{5}{12}$.

Answer

A2 Needed today [1 mark]
Work out $1 - (0.45 + 0.2)$.

Answer

A3 From chapter 1 [1 mark]
Find the HCF of 18 and 42.

Answer

A4 Last lesson [1 mark]
An angle of 76° is bisected. How big is each half?

Answer

B Example, then your turn

Year 7

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

A fair dice is rolled. Event A : a square number. Event B : a prime number. Event C : a number greater than 3. Which pairs of events are mutually exclusive? Give a reason for each.

Hint List the scores for each event. Two events are mutually exclusive if no score is in both lists.

B1 A card is taken from cards [3 marks]
numbered 1 to 15. E : an even number. F : a multiple of 5. S : a square number. Is each pair mutually exclusive? Give a reason. (i) E and F (ii) F and S (iii) E and S

EXAMPLE 2

Omar has a 10p coin, a 20p coin and a £1 coin in his pocket. Some money falls out: one, two or all three coins. (a) List the seven amounts that could fall out. (b) Each amount is equally likely. Is it more likely that more than 50p falls out, or less than 50p? Explain your answer.

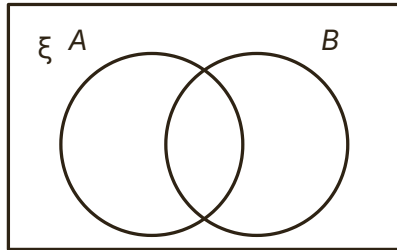
Hint Work systematically: one coin, then two coins, then all three.

B2 Priya has a 5p coin, a 10p coin [3 marks]
and a 20p coin. Some money falls out: one, two or all three coins. Each of the seven possible amounts is equally likely. Work out the probability that more than 18p falls out.

Answer

EXAMPLE 3

Cards are numbered 1 to 10. Set A is the multiples of 3. Set B is the numbers greater than 5. Put every number in the Venn diagram. Then work out the probability that a card taken at random is a multiple of 3 and greater than 5.



Hint Numbers in both sets go in the overlap.
Numbers in neither set go outside both circles.

EXAMPLE 4

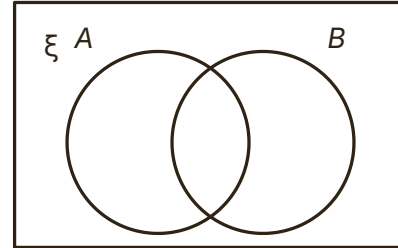
A spinner can land on red, blue, green or yellow. The table shows the probabilities. (a) Work out the probability of green. (b) Work out the probability of red or blue. (c) Work out the probability of not yellow.

Colour	Probability
Red	0.15
Blue	0.4
Green	?
Yellow	0.2

Hint The four colours cover every outcome and cannot happen together, so their probabilities add up to 1.

B3 Cards are numbered 1 to 16. [3 marks]

Set A is the factors of 16. Set B is the odd numbers. Complete the Venn diagram. Then work out the probability that a card taken at random is a factor of 16 and odd.



Answer

B4 A tile is picked from a bag. [3 marks]

Each tile shows P, Q, R or S. The table shows the probabilities. Work out (i) the probability of Q, (ii) the probability of P or R, (iii) the probability of not S.

Letter	Probability
P	0.32
Q	?
R	0.18
S	0.27

Answer (i) (ii) (iii)

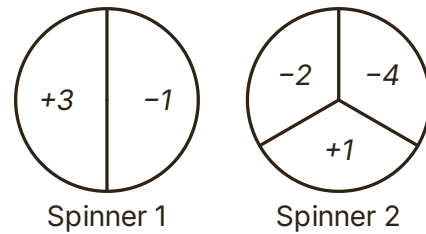
C1 A bottle holds red, green and black beads. One bead is seen. [2 marks]
Are the events "the bead is green" and "the bead is not red" mutually exclusive? Give a reason for your answer.

C2 A bottle holds 30 beads. Sam [1 mark]
sees one bead at a time. In 20 looks he sees 14 green beads and 6 red beads. Sam says, "There are only green and red beads in the bottle." Explain why Sam cannot be sure.

C3 A set of 30 cards each shows [2 marks]
one animal. The table shows how many cards show each animal. A card is taken at random. Work out the probability that it shows a dog or a rabbit.

Animal	Number of cards
Cat	9
Dog	12
Rabbit	?
Horse	4

C4 Both spinners are spun and the [2 marks]
two scores are added. Is a positive total or a negative total more likely? Show your working.



Answer

Answer

C5 A fair dice is rolled. Which pair [2 marks]
of events is both mutually exclusive and exhaustive? (i) "less than 4" and "more than 4"
(ii) "a factor of 6" and "4 or 5"
(iii) "even" and "a multiple of 3".
Give a reason for your answer.

Answer

D1 A biased spinner can land on red, blue, green or yellow. The table shows some of the probabilities. The probability of green is the same as the probability of yellow.

- (a) Work out the value of x . [2 marks]

Colour	Red	Blue	Green	Yellow
Probability	0.18	0.34	x	x

Answer

- (b) Work out the probability that the spinner lands on red or blue.

[1 mark]

Answer

- (c) Work out the probability that the spinner does not land on yellow.

[1 mark]

Answer

Total for D1: 4 marks

D2 Kai rolls a fair dice. He says, "The probability of an even number or a number greater than 4 is $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$."

[3 marks]

Is Kai correct? Explain your answer and give the correct probability.

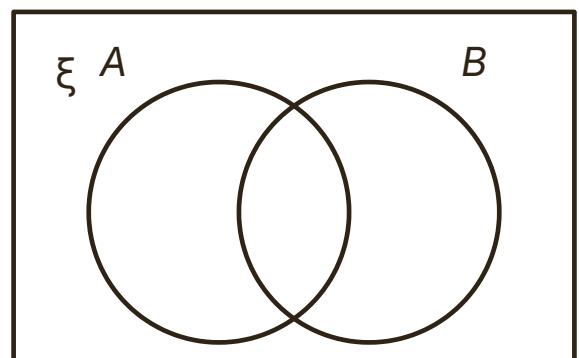
D3 $\xi = \{1, 2, 3, \dots, 15\}$. A is the multiples of 3. B is the factors of 30.

- (a) Complete the Venn diagram. [3 marks]

- (b) A number is chosen at random from ξ . Work out the probability that it is in A and in B . [1 mark]

Answer

- (c) Are A and B mutually exclusive? Give a reason for your answer. [1 mark]



Total for D3: 5 marks

D4 A bag contains only red, blue and green counters. The probability of taking a red counter is 0.4. There are twice as many blue counters as green counters.

(a) Work out the probability of taking a green counter. [3 marks]

Answer

(b) There are 12 red counters in the bag. Work out the total number of counters in the bag. [2 marks]

Answer

Total for D4: 5 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 Tara has four coins: 5p, 10p, 20p and 50p. Some money falls out of her pocket: one or more of the coins. Each possible set of coins is equally likely. Work out the probability that more than 40p falls out. [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** List every set of coins in an organised way: one coin, two coins, three coins, all four.
- Hint 2** There are 4 sets of one coin, 6 of two, 4 of three and 1 of four: 15 sets.
- Hint 3** Totals over 40p: 50p, 55p, 60p, 70p, 65p, 75p, 80p, 85p. That is 8 of the 15 sets, so the probability is $\frac{8}{15}$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can decide whether two events are mutually exclusive and give a reason. ☐ ☐ ☐

I can put numbers in a Venn diagram and find a probability from it. ☐ ☐ ☐

I can use the fact that the probabilities of exhaustive outcomes add up to 1. ☐ ☐ ☐

I can list every outcome in an organised way. ☐ ☐ ☐