THIRD SPACE LEARNING

15 Probability Questions

15 probability questions and practice problems, including some exam style questions

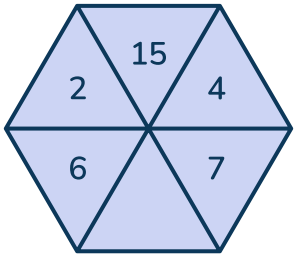
Middle and High School

Questions

Name: ..... Class: .....

Date: ..... Score: .....

1 Which number could be added to this spinner to make it more likely that the spinner will land on an odd number than a prime number?



a) 3
b) 9
c) 5
d) 11

Answer

2 Ifan rolls a fair dice, with sides labeled A, B, C, D, E and F. What is the probability that the dice lands on a vowel?

a) $\frac{1}{6}$

b) $\frac{1}{3}$

c) $\frac{1}{2}$

d) $\frac{2}{3}$

Answer

3 Max tested a coin to see whether it was fair. The table shows the results of his coin toss experiment:

Heads	Tails
26	41

What is the relative frequency of the coin landing on heads?

a) $\frac{1}{2}$

b) $\frac{26}{41}$

c) $\frac{26}{67}$

d) $\frac{41}{67}$

Answer

4 Grace rolled two dice. She then did something with the two numbers shown. Here is a sample space diagram showing all the possible outcomes:

		Dice 2					
		1	2	3	4	5	6
Dice 1	1	0	1	2	3	4	5
	2	1	0	1	2	3	4
	3	2	1	0	1	2	3
	4	3	2	1	0	1	2
	5	4	3	2	1	0	1
	6	5	4	3	2	1	0

What did Grace do with the two numbers shown on the dice?

a) Add them together

b) Subtract the number on dice 2 from the number on dice 1

c) Multiply them

d) Subtract the smaller number from the bigger number

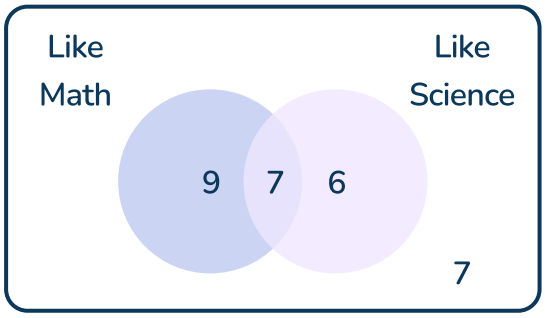
Answer

5 Alice has some red balls and some black balls in a bag. Altogether she has 25 balls. Alice picks one ball from the bag. The probability that Alice picks a red ball is x and the probability that Alice picks a black ball is 4x. Work out how many black balls are in the bag.

a) 6
b) 100
c) 20
d) 5

Answer

6 Arthur asked the students in his class whether they like math and whether they like science. He recorded his results in the venn diagram below.



How many students don't like science?

a) 16
b) 23
c) 7
d) 6

Answer

7 A restaurant offers the following options:

Starter – soup or salad
Main – chicken, fish or vegetarian
Dessert – ice cream or cake

How many possible different combinations of starter, main and dessert are there?

a) 7
b) 12
c) 8
d) 27

Answer

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8 There are 18 girls and 12 boys in a class.
$\frac{2}{9}$ of the girls and $\frac{1}{4}$ of the boys walk to school. One of the students who walks to school is chosen at random. Find the probability that the student is a boy.

a) $\frac{12}{30}$

b) $\frac{3}{7}$

c) $\frac{1}{4}$

d) $\frac{3}{12}$

Answer

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9 Rachel flips a biased coin. The probability that she gets two heads is 0.16
What is the probability that she gets two tails?

a) 0.84
b) 0.6
c) 0.36
d) 0.7056

Answer

10 I have a big tub of jelly beans. The probability of picking each different color of jelly bean is shown below:

Colour	Red	Yellow	Green	Purple	Orange
Probability	0.2	0.15	0.1	0.3	

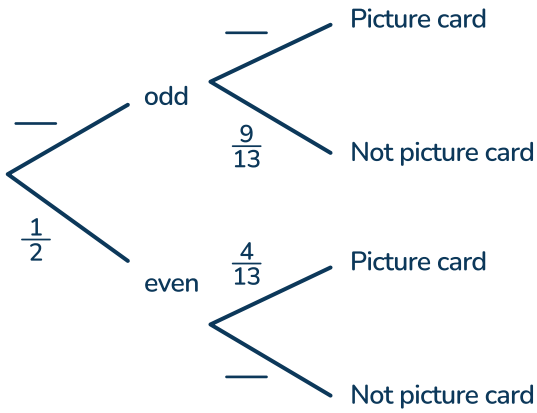
If I were to pick 60 jelly beans from the tub, how many orange jelly beans would I expect to pick?

a) 25
b) 12
c) 0
d) 15

Answer

11 Dexter runs a game at a fair. To play the game, you must roll a dice and pick a card from a deck of cards.

To win the game you must roll an odd number and pick a picture card. The game can be represented by the tree diagram below.



Dexter charges players $1 to play and gives $3 to any winners. If 260 people play the game, how much profit would Dexter expect to make?

a) $65
b) $260
c) $140
d) $120

Answer

12 A fair coin is tossed three times. Work out the probability of getting two heads and one tail.

a) $\frac{1}{8}$

b) $\frac{3}{8}$

c) $\frac{1}{2}$

d) $\frac{1}{6}$

Answer

13 200 people were asked about which athletic event they thought was the most exciting to watch. The results are shown in the table below.

	100m	Long jump	Javelin
Male	56	30	24
Female	32	29	29

A person is chosen at random. Given that that person chose 100m, what is the probability that the person was female?

a) $\frac{32}{200}$

b) $\frac{32}{100}$

c) $\frac{32}{88}$

d) $\frac{32}{56}$

Answer

14 Sam asked 50 people whether they like vegetable pizza or pepperoni pizza.

37 people like vegetable pizza.
25 people like both.
3 people like neither.

Sam picked one of the 50 people at random. Given that the person he chose likes pepperoni pizza, find the probability that they don't like vegetable pizza.

a) $\frac{12}{50}$

b) $\frac{3}{50}$

c) $\frac{12}{35}$

d) $\frac{10}{35}$

Answer

15 There are 12 marbles in a bag. There are n red marbles and the rest are blue marbles. Nico takes 2 marbles from the bag. Write an expression involving n for the probability that Nico takes one red marble and one blue marble.

a) $\frac{n\,(12 - n)}{66}$

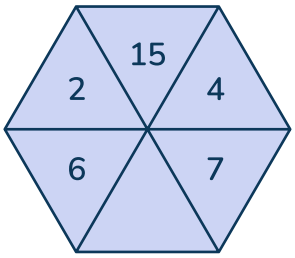
b) $\frac{n\,(n - 1)}{132}$

c) $\frac{(12 - n)(11 - n)}{132}$

d) $\frac{n\,(12 - n)}{132}$

Answer

Answers

Question Number	Question	Answer
1	Which number could be added to this spinner to make it more likely that the spinner will land on an odd number than a prime number?  	b) 9 Currently there are two odd numbers and two prime numbers so the chances of landing on an odd number or a prime number are the same. By adding 3, 5 or 11 you would be adding one prime number and one odd number so the chances would remain equal. By adding 9 you would be adding an odd number but not a prime number. There would be three odd numbers and two prime numbers so the spinner would be more likely to land on an odd number than a prime number.
2	Ifan rolls a fair dice, with sides labeled A, B, C, D, E and F. What is the probability that the dice lands on a vowel?	b) $\frac{1}{3}$ A and E are vowels so there are 2 outcomes that are vowels out of 6 outcomes altogether. Therefore the probability is $\frac{2}{6}$ which can be simplified to $\frac{1}{3}$.
3	Max tested a coin to see whether it was fair. The table shows the results of his coin toss experiment: Heads 26 Tails 41 What is the relative frequency of the coin landing on heads?	c) $\frac{26}{67}$ Max tossed the coin 67 times and it landed on heads 26 times. $\text{Relative frequency (experimental probability)} = \frac{\text{number of successful trials}}{\text{total number of trials}} = \frac{26}{67}$

Answers

Question Number	Question	Answer
4	Grace rolled two dice. She then did something with the two numbers shown. Here is a sample space diagram showing all the possible outcomes: Dice 2 / Dice 1 1 2 3 4 5 6 1 0 1 2 3 4 5 2 1 0 1 2 3 4 3 2 1 0 1 2 3 4 3 2 1 0 1 2 5 4 3 2 1 0 1 6 5 4 3 2 1 0 What did Grace do with the two numbers shown on the dice?	d) Subtract the smaller number from the bigger number For each pair of numbers, Grace subtracted the smaller number from the bigger number. For example, if she rolled a 2 and a 5, she did 5 – 2 = 3.
5	Alice has some red balls and some black balls in a bag. Altogether she has 25 balls. Alice picks one ball from the bag. The probability that Alice picks a red ball is x and the probability that Alice picks a black ball is 4x. Work out how many black balls are in the bag.	c) 20 Since the probability of mutually exclusive events add to 1: $x + 4x = 1$ $5x = 1$ $x = \frac{1}{5}$ $\frac{1}{5}$ of the balls are red and $\frac{4}{5}$ of the balls are blue. $\frac{4}{5}$ of 25 = 20
6	Arthur asked the students in his class whether they like math and whether they like science. He recorded his results in the venn diagram below. Like Math Like Science 9 7 6 7	a) 16 We need to look at the numbers that are not in the 'Like science' circle. In this case it is 9 + 7 = 16.

Answers

Question Number	Question	Answer
7	A restaurant offers the following options: Starter – soup or salad Main – chicken, fish or vegetarian Dessert – ice cream or cake How many possible different combinations of starter, main and dessert are there?	b) 12 The number of different combinations is $2 \times 3 \times 2 = 12$.
8	There are 18 girls and 12 boys in a class. $\frac{2}{9}$ of the girls and $\frac{1}{4}$ of the boys walk to school. One of the students who walks to school is chosen at random. Find the probability that the student is a boy.	b) $\frac{3}{7}$ First we need to work out how many students walk to school: $\frac{2}{9}$ of 18 = 4 $\frac{1}{4}$ of 12 = 3 4 + 3 = 7 7 students walk to school. 4 are girls and 3 are boys. The probability the student is a boy is $\frac{3}{7}$.

Answers

<table>
<tr><th>Question Number</th><th>Question</th><th>Answer</th></tr>
<tr><td>9</td><td>Rachel flips a biased coin. The probability that she gets two heads is 0.16
What is the probability that she gets two tails?</td><td>c) 0.36

We have been given the probability of getting two heads. We need to calculate the probability of getting a head on each flip.

Let’s call the probability of getting a head p.

The probability p, of getting a head AND getting another head is 0.16.

Therefore to find p:
$p \times p = 0.16$
$p^2 = 0.16$
$p = 0.4$

The probability of getting a head is 0.4 so the probability of getting a tail is 0.6

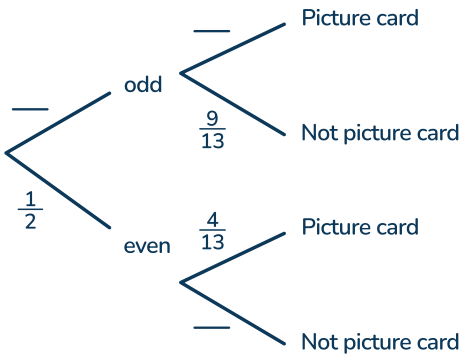
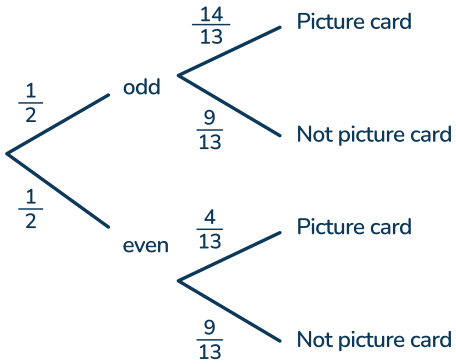
The probability of getting two tails is $0.6 \times 0.6 = 0.36$</td></tr>
<tr><td>10</td><td>I have a big tub of jelly beans. The probability of picking each different color of jelly bean is shown below:
<table><tr><td>Colour</td><td>Red</td><td>Yellow</td><td>Green</td><td>Purple</td><td>Orange</td></tr><tr><td>Probability</td><td>0.2</td><td>0.15</td><td>0.1</td><td>0.3</td><td></td></tr></table>
If I were to pick 60 jelly beans from the tub, how many orange jelly beans would I expect to pick?</td><td>d) 15

First we need to calculate the probability of picking an orange. Probabilities sum to 1 so
$1 - (0.2 + 0.15 + 0.1 + 0.3) = 0.25$.

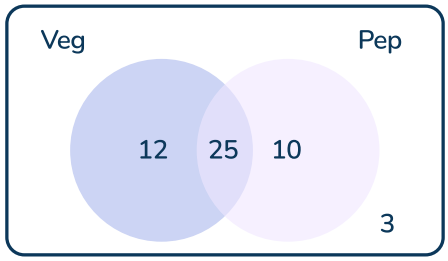
The probability of picking an orange is 0.25.

The number of times I would expect to pick an orange jelly bean is $0.25 \times 60 = 15$.</td></tr>
</table>

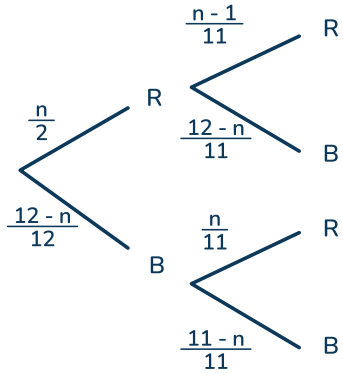
Answers

Question Number	Question	Answer
11	Dexter runs a game at a fair. To play the game, you must roll a dice and pick a card from a deck of cards. To win the game you must roll an odd number and pick a picture card. The game can be represented by the tree diagram below.  Dexter charges players \$1 to play and gives \$3 to any winners. If 260 people play the game, how much profit would Dexter expect to make?	c) \$140 Completing the tree diagram:  Probability of winning is $\frac{1}{2} \times \frac{4}{13} = \frac{4}{26}$ If 260 play the game, Dexter would receive \$260. The expected number of winners would be $\frac{4}{26} \times 260 = 40$ Dexter would need to give away $40 \times \$3 = \$120$. Therefore Dexter's profit would be $\$260 - \$120 = \$140$.
12	A fair coin is tossed three times. Work out the probability of getting two heads and one tail.	b) $\frac{3}{8}$ There are three ways of getting two heads and one tail: HHT, HTH or THH. The probability of each is $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$ Therefore the total probability is $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8}$

Answers

Question Number	Question	Answer
13	200 people were asked about which athletic event they thought was the most exciting to watch. The results are shown in the table below. | | 100m | Long jump | Javelin | | Male | 56 | 30 | 24 | | Female | 32 | 29 | 29 | A person is chosen at random. Given that that person chose 100m, what is the probability that the person was female?	c) $\frac{32}{88}$ Since we know that the person chose 100m, we need to include the people in that column only. In total 88 people chose 100m so the probability the person was female is $\frac{32}{88}$.
14	Sam asked 50 people whether they like vegetable pizza or pepperoni pizza. 37 people like vegetable pizza. 25 people like both. 3 people like neither. Sam picked one of the 50 people at random. Given that the person he chose likes pepperoni pizza, find the probability that they don't like vegetable pizza.	We need to draw a Venn diagram to work this out. We start by putting the 25 who like both in the middle section. The 37 people who like vegetable pizza includes the 25 who like both, so 12 more people must like vegetable pizza. 3 don't like either. We have 50 – 12 – 25 – 3 = 10 people left so this is the number that must like only pepperoni.  There are 35 people altogether who like pepperoni pizza. Of these, 10 do not like vegetable pizza. The probability is $\frac{10}{35}$.

Answers

Question Number	Question	Answer
15	There are 12 marbles in a bag. There are n red marbles and the rest are blue marbles. Nico takes 2 marbles from the bag. Write an expression involving n for the probability that Nico takes one red marble and one blue marble.	a) $\frac{n(12-n)}{66}$ We need to think about this using a tree diagram. If there are 12 marbles altogether and n are red then 12 − n are blue.  To get one red and one blue, Nico could choose red then blue or blue then red so the probability is: $\frac{n}{12} \times \frac{12-n}{11} + \frac{12-n}{11} \times \frac{n}{11} = \frac{n(12-n)}{132} + \frac{n(12-n)}{132}$ $= \frac{2n(12-n)}{132}$ $= \frac{n(12-n)}{66}$

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