Year 9 probability worksheet

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Name: _____ Date: _____

Question 1

A bag contains 4 red, 7 blue and 9 green marbles. One marble is chosen at random. Find:

(a) P(blue) (b) P(not green) (c) P(red or green)

Answer: _____

Question 2

A group of 40 students were surveyed about whether they play sport and whether they play a musical instrument. The results are shown in the two-way table below.

	Plays sport	Does not play sport	Total
Plays instrument	9	6	15
Does not play instrument	17	8	25
Total	26	14	40

Use the table to estimate: (a) P(plays sport and plays instrument) (b) P(plays sport or plays instrument), using inclusive or (c) P(does not play sport)

Answer: _____

Question 3

Let $\xi = \{1, 2, 3, \ldots, 15\}$, A = {multiples of 3} and B = {multiples of 5}. Find:

(a) $n(A \cap B)$

(b) $n(A \cup B)$

(c) $P(A \cup B)$ if a number is chosen at random from ξ

Answer: _____

Question 4

A box contains cards labelled 1, 2 and 3. One card is drawn at random and not replaced. A second card is then drawn. Using a table, list all possible outcomes and find the probability that the sum of the two cards is greater than 4.

Answer: _____

Question 5

A bag contains one red (R) marble and one blue (B) marble. A marble is drawn at random, its colour is recorded, and it is placed back in the bag. A second marble is then drawn. List all possible outcomes using a tree diagram and find the probability of drawing two marbles of the same colour.

Answer: _____

Question 6

A basketballer took 160 shots at goal in training and scored 112 of them.

(a) Find the relative frequency of scoring, as a decimal.

(b) Use this to estimate how many of her next 50 shots she will score.

Answer: _____

Question 7

Each letter of the word MATHEMATICS is written on a card, and one card is chosen at random. Find the probability that the letter is:

(a) M (b) a vowel (A, E, I, O or U) (c) not T

Answer: _____

Question 8

In a class of 30 students, 18 have a library card, 14 have a bus pass, and 7 have both. Use this information to construct a Venn diagram and then find: (a) P(library card only, and not bus pass) (b) P(library card or bus pass, but not both), exclusive or (c) P(neither library card nor bus pass)

Answer: _____

Question 9

In a class survey, $n(\xi) = 40$, $n(A) = 22$, $n(B) = 15$ and $n(A \cap B) = 6$. Find:

(a) $n(A \cup B)$

(b) $n(A' \cap B')$

(c) $P(A \cap B')$, as a decimal

Answer: _____

Question 10

A spinner has three equal sections labelled A, B and C. The spinner is spun once and the result is recorded. Then one card is drawn at random from two cards labelled 1 and 2, without any replacement consideration (the cards are separate from the spinner). Using a table or tree diagram, list all possible outcomes and find the probability that the result is the letter B or the number 2 (or both).

Answer: _____

Year 9 probability: answers and worked solutions

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Question 1

Key idea: For equally likely outcomes, P(event) = (number of favourable outcomes)/(total number of outcomes).

1. Total: 4 + 7 + 9 = 20 marbles 2. (a) P(blue) = 7/20 3. (b) Not green: 4 + 7 = 11, so 11/20 (or 1 - 9/20) 4. (c) Red or green: 4 + 9 = 13, so 13/20

Answer: (a) 7/20 (b) 11/20 (c) 13/20

Question 2

Key idea: Relative frequency = (frequency of event)/(total number of observations) estimates probability. For inclusive or, use P(A or B) = P(A) + P(B) - P(A and B).

1. There are 40 students in total. 2. **(a)** 9 students play both sport and an instrument.\ P(sport and instrument) = 9/40 3. **(b)** 26 play sport, 15 play instrument, 9 play both.\ P(sport or instrument) = 26/40 + 15/40 - 9/40 = 32/40 = ⅘ 4. **(c)** 14 students do not play sport.\ P(not sport) = 14/40 = 7/20

Answer: (a) 9/40, (b) ⅘, (c) 7/20

Question 3

Key idea: A ∩ B means in both sets; A ∪ B means in either set or both.

1. A = {3, 6, 9, 12, 15} and B = {5, 10, 15} 2. A ∩ B = {15}, so n(A ∩ B) = 1 3. A ∪ B = {3, 5, 6, 9, 10, 12, 15}, so n(A ∪ B) = 7 4. P(A ∪ B) = 7/15

Answer: (a) 1 (b) 7 (c) 7/15

Question 4

Key idea: Without replacement, the first card drawn cannot be drawn again, so it does not appear as a second draw.

1. Set up a table with the first draw as rows and the second draw as columns, leaving out pairs where both cards are the same (since the first card is not replaced):

First \ Second	1	2	3
1	,	(1, 2)	(1, 3)
2	(2, 1)	,	(2, 3)
3	(3, 1)	(3, 2)	,

2. Count the total number of possible outcomes: 6. 3. Find the sums: (1,2)→3, (1,3)→4, (2,1)→3, (2,3)→5, (3,1)→4, (3,2)→5. 4. Outcomes with sum greater than 4: (2,3) and (3,2), giving 2 outcomes. 5. Calculate the probability:\ P(sum > 4) = 2/6 = ⅓ **Answer:** ⅓

Question 5

Key idea: When drawing with replacement, the bag is returned to its original state before the second draw, so the probabilities on each branch stay the same.

1. Draw the first branch: outcomes R or B, each with probability ½. 2. From each first outcome, draw a second branch: outcomes R or B, each again with probability ½ (bag reset). 3. List all four equally likely outcomes: RR, RB, BR, BB. 4. Identify outcomes where both marbles match: RR and BB. 5. Calculate the probability:\ P(same colour) = 2/4 = ½ **Answer:** ½

Question 6

Key idea: Relative frequency = number of successes ÷ number of trials.

1. 112/160 = 0.7 2. 0.7 × 50 = 35

Answer: (a) 0.7 (b) 35

Question 7

Key idea: Count every card, including repeated letters, to find the total number of equally likely outcomes.

1. MATHEMATICS has 11 letters: M, A, T, H, E, M, A, T, I, C, S 2. (a) There are 2 Ms, so 2/11 3. (b) Vowels: A, E, A, I, which is 4, so 4/11 4. (c) There are 2 Ts, so 11 - 2 = 9 cards are not T: 9/11

Answer: (a) 2/11 (b) 4/11 (c) 9/11

Question 8

Key idea: Fill in a Venn diagram from the inside out. Exclusive or means one event or the other, but not both.

1. Both: 7. Library card only: 18 - 7 = 11. Bus pass only: 14 - 7 = 7. Neither: 30 - 11 - 7 - 7 = 5. 2. **(a)** Library card only (not bus pass): 11 students.\ P(library only) = 11/30 3. **(b)** Exclusive or means library only or bus pass only.\ P(library or bus pass, not both) = (11 + 7)/(30) = 18/30 = ⅗ 4. **(c)** Neither: 5 students.\ P(neither) = 5/30 = ⅙

Answer: (a) 11/30, (b) ⅗, (c) ⅙

Question 9

Key idea: n(A ∪ B) = n(A) + n(B) - n(A ∩ B).

1. n(A ∪ B) = 22 + 15 - 6 = 31 2. n(A' ∩ B') = 40 - 31 = 9 3. n(A ∩ B') = 22 - 6 = 16, so P(A ∩ B') = 16/40 = 0.4

Answer: (a) 31 (b) 9 (c) 0.4

Question 10

Key idea: List all outcomes from the two independent steps, then use the sample space to count favourable outcomes.

1. Set up a table with the spinner result (A, B, C) as rows and the card drawn (1, 2) as columns:

Spinner \ Card	1	2
A	(A, 1)	(A, 2)
B	(B, 1)	(B, 2)
C	(C, 1)	(C, 2)

2. Count the total number of equally likely outcomes: 6. 3. Identify outcomes that include B or 2 (or both): (A, 2), (B, 1), (B, 2), (C, 2). That is 4 outcomes. 4. Calculate the probability:\ P(B or 2) = 4/6 = ⅔ **Answer:** ⅔