UNIT TEST #008 | Australian Curriculum Mathematics | UTM7T4U8

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Probability

7 Unit Test

Free and always will be!

Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

a) If you flip a fair coin, what is the probability of getting heads?

A. 0 % **B.** 25 % **C.** 50 % **D.** 100 %

○ A ○ B ○ C ○ D

Space for Q1a...

b) What does a probability of 1 mean?

A. The event is very unlikely but possible.
B. The event will certainly happen.
C. The event is impossible.
D. The event has an equal chance of happening or not.

A B C D

Space for Q1b...

Question 2:

a) What is the probability of an impossible event?

A. $0\,\%$ **B.** $25\,\%$ **C.** $50\,\%$ **D.** $100\,\%$

A B C D

Space for Q2a...

b) If you flip a normal six sided die, what is the probability of getting an odd number?

A. $0\,\%$ **B.** $25\,\%$ **C.** $50\,\%$ **D.** $100\,\%$

A B C D

Space for Q2b...

Part 2: Short Answer (4 marks)

Question 3:

a) Explain how you would calculate the probability of drawing a heart from a standard deck of 52 cards.

b) If you roll a standard six-sided die, what is the probability of rolling a number greater than 4?

Question 4:

a) If you flip two coins, what is the probability of getting two tails?

b) What is the probability of drawing a red card or a Queen from a standard deck of cards?

Part 3: Problem Solving (4 marks)

Question 5:

a) You have a bag with 5 red marbles, 3 blue marbles, and 2 green marbles. What is the probability of drawing a blue marble?

b) Conduct a simple experiment by simulating rolling two dice 30 times. Record how many times the sum is 7 .

I) Estimate the *experimental* probability of rolling a sum of 7 .

Extension:

II) Calculate the theoretical probability and comment on similarities or differences.

Question 6:

a) If you roll a die twice, what is the probability of getting a 3 on the first roll and a 3 on the second roll?

b) In a deck of 52 cards, if the probability of drawing a spade is $\frac{1}{4}$, what is the probability of not drawing a heart?

Solutions

1a. (0.5 marks)

C. $50\ \%$ - Since a coin has two sides, and each side has an equal chance of facing up, the probability of heads is $50\ \%$.

b. (0.5 marks)

B. The event will certainly happen - A probability of 1 means the event is certain.

2a. (0.5 marks)

A. $0\ \%$.

b. (0.5 marks)

C. $50\ \%$. -There are three odd numbers out of six numbers in total $= \frac{1}{2} = 0.5 = 50\ \%$.

3a. (1 mark)

A standard deck has 4 suits, each with 13 cards, so there are 13 hearts. The probability is calculated as:

$$
\begin{aligned}
P(\text{Heart}) &= \frac{\text{Number of Hearts}}{\text{Total Cards}} \\
&= \frac{13 \div 13}{52 \div 13} \\
&= \frac{1}{4} \text{ or } 25\ \%.
\end{aligned}
$$

b. (1 mark)

Numbers greater than 4 are: 5 & 6 . There are 2 favourable outcomes out of 6 possibilities, so:

$$
\begin{aligned}
P(\text{Favourable Outcome}) &= \frac{\text{Number of Favourable Outcomes}}{\text{Total Number of outcomes}} \\
P(\text{Number} > 4) &= \frac{2 \div 2}{6 \div 2} \\
&= \frac{1}{3} \text{ or } \approx 33.33\ \%.
\end{aligned}
$$

4a. (1 mark)

Each coin flip is independent with a probability of tails being $\frac{1}{2}$.

For two tails, you multiply the probabilities:

$$
\begin{aligned}
&\frac{1}{2} \times \frac{1}{2} \\
&= \frac{1 \times 1}{2 \times 2} \\
&= \frac{1}{4} = 0.25 = 25\ \%.
\end{aligned}
$$

b. (1 mark)

There are 26 red cards (13 hearts + 13 diamonds), and 4 Queens,
but the red queens are counted twice in this sum, so we must remove them from the final tally:

Probability of red card or queen

$$\begin{aligned} &= \frac{26}{52} + \frac{4}{52} - \frac{2}{52} \\ &= \frac{26+4-2}{52} \\ &= \frac{28}{52} \\ &= \frac{7}{13} \approx 0.54 \approx 54\,\%\,. \end{aligned}$$

5a. (1 mark)

There are 10 marbles in total (5 red + 3 blue + 2 green). The probability of drawing a blue marble is:

$$P(\text{Favourable Outcome}) = \frac{\text{Number of Favourable Outcomes}}{\text{Total Number of Outcomes}}$$

$$P(\text{Blue}) = \frac{\text{Number of Blue Marbles}}{\text{Total Marbles}}$$

$$= \frac{3}{10} \text{ or } 30\,\%\,.$$

b. (1 mark)

I.

Experimental Probability:

[Assuming the experiment is conducted and the following parameters are defined:]

If you rolled a sum of 7, six times, the experimental probability would be:

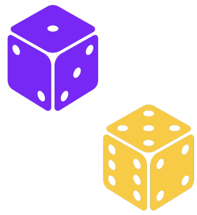
$$P(\text{Favourable Outcome}) = \frac{\text{Number of Favourable Outcomes}}{\text{Total Number of Outcomes}}$$

$$\begin{aligned} P(\text{Sum of 7}) &= \frac{\text{Number of Times Sum is 7}}{\text{Total Rolls}} \\ &= \frac{6 \div 6}{30 \div 6} \\ &= \frac{1}{5} \text{ or } \frac{2}{10} \\ &= \frac{1}{5} \text{ or } 0.2 \text{ or } 20\,\%\,. \end{aligned}$$

II.
(*Extension Question*)

Two dice, one roll, possible outcomes:

$$\rightarrow \begin{array}{l} 1+1,\ 1+2,\ 1+3,\ 1+4,\ 1+5,\ 1+6 \\ 2+1,\ 2+2,\ 2+3,\ 2+4,\ 2+5,\ 2+6 \\ 3+1,\ 3+2,\ 4+3,\ 3+4,\ 3+5,\ 3+6 \\ 4+1,\ 4+2,\ 4+3,\ 4+4,\ 4+5,\ 4+6 \\ 5+1,\ 5+2,\ 5+3,\ 5+4,\ 5+5,\ 5+6 \\ 6+1,\ 6+2,\ 6+3,\ 6+4,\ 6+5,\ 6+6 \end{array}$$



$$= \begin{array}{llllll} 2, & 3, & 4, & 5, & 6, & 7, \\ 3, & 4, & 5, & 6, & 7, & 8, \\ 4, & 5, & 6, & 7, & 8, & 9, \\ 5, & 6, & 7, & 8, & 9, & 10, \\ 6, & 7, & 8, & 9, & 10, & 11, \\ 7, & 8, & 9, & 10, & 11, & 12, \end{array}$$

Total number of outcomes: 36, Total number of times the sum is seven: 6 .

Theoretical Probability:

$$P(\text{Favourable Outcome}) = \frac{\text{Number of Favourable Outcomes}}{\text{Total Number of Outcomes}}$$

$$P(\text{Sum of 7}) = \frac{\text{Number of Times Sum is 7}}{\text{Total Rolls}}$$

$$= \frac{6 \div 6}{36 \div 6}$$

$$= \frac{1}{6} \text{ or } \approx 0.1667 \text{ or } \approx 16.67\,\% \,.$$

Note: $\frac{1}{5}$ is an experimental probability and differs from the theoretical probability, which is $\frac{1}{6}$ or approximately $16.67\,\%$.

The difference is due to reality nearly always, will be different from calculated probabilities.

This could be due to the small number of trials (30 rolls); as the number of trials increases, the experimental probability would approach the theoretical probability.

AND / OR it could be from an unfair di or dice that give bias to a particular number.

6a. (1 mark)

Since the events are independent, you multiply the probabilities:

$$\frac{1}{6} \times \frac{1}{6}$$
$$= \frac{1 \times 1}{6 \times 6}$$
$$= \frac{1}{36} = 0.027\dot{7} = 2.7\dot{7}\,\%\,.$$

b. (1 mark)

Probability of not drawing a spade: (Remember: $P(\text{Spade}) = \frac{13 \div 13}{52 \div 13} = \frac{1}{4}\ (= 0.25)$)

$$= 1 - \frac{1}{4}$$
$$= \frac{1}{1} \times 4 - \frac{1}{4}$$ *turn 1 into a fraction, with a denominator of 4
$$= \frac{1 \times 4}{1 \times 4} - \frac{1}{4}$$
$$= \frac{4}{4} - \frac{1}{4}$$
$$= \frac{4 - 1}{4}$$
$$= \frac{3}{4} = 0.75 = 75\,\%\,.$$

$$\sum = \frac{\quad}{10} = \qquad \%$$

General Assessment Marking Standards

Remember: When your official tests are marked, they won't be a score out of 10, they will be a grade (A,B,C,D,E) based on the following standards:

ACiQ | v9.0

Year 7 Mathematics standard elaborations

The folio of student work contains evidence of the following:

Mathematical proficiencies	A	B	C	D	E
Understanding	accurate and consistent identification, representation, description and connection of mathematical concepts and relationships in complex unfamiliar, complex familiar, and simple familiar situations	accurate identification, representation, description and connection of mathematical concepts and relationships in complex familiar and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
Fluency	choice, use and application of comprehensive facts, definitions, and procedures to find solutions in complex unfamiliar, complex familiar, and simple familiar situations	choice, use and application of effective facts, definitions, and procedures to find solutions in complex familiar and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	detailed explanation of mathematical thinking, strategies used, and conclusions reached in complex familiar and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
Problem-solving	purposeful use of problem-solving approaches to find solutions to problems.	effective use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	partial use of problem-solving approaches to make progress towards finding solutions to problems.	fragmented use of problem-solving approaches to make progress towards finding solutions to problems.

Key shading emphasises the qualities that discriminate between the A–E descriptors

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