Probability 7

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Focus: A set of questions and solutions for Year 7 students on Probability, tailored to the Australian Curriculum under the strand 'Statistics and Probability':

1. Basic Concepts of Probability

a) Define probability and explain what a probability of 0.5 means.

b) What is the probability of an event that is certain to happen?

2. Probability of Simple Events

a) If you roll a die, what is the probability of rolling a 4?

b) A bag contains 5 red marbles, 3 blue marbles, and 2 green marbles. What is the probability of picking a blue marble?

3. Complementary Events

a) If the probability of rain tomorrow is 0.7, what is the probability it will not rain?

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

4. Probability of Multiple Events

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

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

5. Real-World Applications

a) A spinner has sections labelled $1, 2, 3, 4, 5,$ **and** 6 **, each with an equal area. What's the probability of landing on a prime number?**

b) In a class where 60% **of students play soccer and** 40% **play basketball, what can you say about the probability of a student playing both sports if these are independent events?**

6. Conditional Probability

a) In a group of 10 **students,** 7 **like math and** 3 **like both math and science. If a student likes math, what is the probability they also like science?**

b) Suppose 20% **of a school's students are in the choir, and** 50% **of choir members are also in the band. What percentage of the school's students are in both the choir and the band?**

Solutions

1a.

Probability is the measure of the likelihood that an event will occur. A probability of 0.5 means there's an equal chance of the event happening or not happening; it's like flipping a fair coin where heads or tails each have a 50% chance.

b.

An event certain to happen has a probability of 1 (or 100%).

2a.

A die has 6 faces, each with an equal chance.

The probability of rolling a 4 is $\dfrac{1}{6}$.

b.

Total marbles $= 5 + 3 + 2 = 10$.

Probability of picking a blue marble

$$= \frac{3}{10}.$$

3a.

The probabilities of complementary events sum to 1.
Therefore, the probability it will not rain is:
$1 - 0.7 = 0.3$.

b.

Probability of not drawing a heart: (Remember: $P(\text{Heart}) = \dfrac{13 \div 13}{52 \div 13} = \dfrac{1}{4}$ ($= 0.25$))

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

$$= \frac{1}{1} \times 4 - \frac{1}{4} \quad \text{*turn 1 into a fraction, with a denominator of 4}$$

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

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

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

$$= \frac{3}{4}.$$

4a.

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

For two heads, you multiply the probabilities:

$$\dfrac{1}{2} \times \dfrac{1}{2}$$

$$= \dfrac{1 \times 1}{2 \times 2}$$

$$= \dfrac{1}{4}.$$

b.

There are 26 red cards (13 hearts + 13 diamonds), and 4 kings, but the red kings are counted twice in this sum, so:

Probability of red card or king

$$= \dfrac{26}{52} + \dfrac{4}{52} - \dfrac{2}{52}$$

$$= \dfrac{26 + 4 - 2}{52}$$

$$= \dfrac{28}{52}$$

$$= \dfrac{7}{13}.$$

5a.

Prime numbers from 1 to 6 are $2, 3,$ and 5.

Probability

$$= \dfrac{3}{6}$$

$$= \dfrac{1}{2}.$$

b.

If playing soccer and basketball are independent, the probability of playing both would be the product of their individual probabilities:

Probability of playing both

$$= 0.6 \times 0.4$$
$$= 0.24.$$

6a.

Given that a student likes math, the probability they like science is:

$$\frac{\text{Number who like both}}{\text{Number who like math}}$$

$$= \frac{3}{7}.$$

b.

Probability of being in both = Probability of being in choir $\times$ Probability of being in band given in choir:

$$0.20 \times 0.50$$

$$= 0.10 \text{ or } 10\%.$$

Additional Notes for Teachers

Learning Outcomes:
Students should understand the concept of probability, how to calculate probabilities for simple and compound events, and start to grasp conditional probability.

Teaching Strategies:
Use dice, coins, cards, or spinners for hands-on probability experiments. Discuss real-life scenarios where probability is relevant, like weather forecasting or games.

Assessment:
Assess through problems that require students to calculate probabilities, interpret results, and solve for conditional probabilities in context.

Resources:
Probability games or apps can make learning engaging. Use physical models for probability experiments, and encourage discussions on how probability affects decision-making.

This set of questions aligns with the Australian Curriculum for Year 7, aiming to develop students' understanding of probability in both theoretical and practical contexts.

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