

Solutions

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1. Determine the number of possible outcomes when a coin is tossed

- a) twice
- b) three times
- c) four times
- d) n times

$$a) 2 \times 2 = 4 \quad (2^2)$$

$$b) 2 \times 2 \times 2 = 8 \quad (2^3)$$

$$c) 2 \times 2 \times 2 \times 2 = 16 \quad (2^4)$$

$$d) 2 \times 2 \times 2 \times \dots = 2^n$$

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2. A committee has 15 people.

- a) In how many ways could a president and vice president be chosen?
b) In how many ways could a president, vice president, and secretary be chosen?

a) President = 15 ways
Vice President = 14 ways
 $\Rightarrow 15 \times 14 = 210$ ways

b) Secretary = 13 ways
 $\Rightarrow 15 \times 14 \times 13 = 2730$ ways

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3. When selecting patio stones, the customer has 10 choices for the type of bricks, 8 choices for colours, and 3 choices for layout. How many choices does the customer have in total?

Multiply \Rightarrow Bricks \times Colours \times Layouts
 $= 10 \times 8 \times 3$
 $= 240$ choices

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4. A set, three-course menu in a restaurant allows the customer to select from four appetizers, five main courses, and three desserts.
- How many options are there?
 - How many choices are there for each option?
 - What is the total number of meal choices for the customer?

a) There are 3 options (courses)

b) Apps = 4 choices

Mains = 5 choices

Desserts = 3 choices

c) $\text{Apps} \times \text{Mains} \times \text{Desserts}$
 $= 4 \times 5 \times 3$
 $= 60 \text{ meal choices}$

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5. A computer randomly selects three different numbers from between 1 and 100. In how many ways can this be done?

- A 3^{100}
 B 100^3
 C $100 \times 99 \times 98$
 D 3×100

Different numbers
 \Rightarrow NO REPEATS

6. On a TV game show, a contestant spins a spinner to randomly select a letter of the alphabet. At the same time, the contestant rolls a standard die. What is the total number of possible outcomes?

- A 32
 B 156
 C 308 915 776
 D 52

26 letters
 6 numbers
 $\Rightarrow 26 \times 6$

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7. How many two-digit numbers can be formed from the digits 1, 2, 3, 4, 5 if repetition is

a) permitted? b) not permitted?

a) 1ST digit = 5 ways \Rightarrow $5 \times 5 = 25$
 2ND digit = 5 ways ways

b) 1ST digit = 5 ways \Rightarrow $5 \times 4 = 20$
 2ND digit = 4 ways ways

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8. How many different outcomes are possible when rolling

a) two 4-sided dice?
 b) three 4-sided dice?
 c) two 8-sided dice?

d) four 8-sided dice?
 e) two 12-sided dice?
 f) five 12-sided dice?
 g) k n-sided dice?

a) $4 \times 4 = 16$
 b) $4 \times 4 \times 4 = 64$
 c) $8 \times 8 = 64$

d) $8 \times 8 \times 8 \times 8 = 4096$
 e) $12 \times 12 = 144$
 f) $12 \times 12 \times 12 \times 12 \times 12$
 $= 248,832$
 g) $n \times n \times n \times \dots$ (k times)
 $= n^k$

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9. A business card design software package provides 25 templates, 38 fonts, and 20 colour combinations. How many different business card designs are available to the user?

$$\begin{aligned} &= \text{Templates} \times \text{Fonts} \times \text{Colours} \\ &= 25 \times 38 \times 20 \\ &= 19,000 \text{ different designs} \end{aligned}$$

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10. Tonya has a job wrapping gifts during the holiday season. There are five colours of paper, six choices for ribbon, and three choices for bows. How many choices does the customer have in total?

$$\begin{aligned} &= \text{Paper} \times \text{Ribbons} \times \text{Bows} \\ &= 5 \times 6 \times 3 \\ &= 90 \text{ choices} \end{aligned}$$

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11. In the game of Yahtzee, five dice are rolled.
How many outcomes are there for rolling
the five dice once?

$$\begin{aligned} & 6 \text{ outcomes on each die} \\ & = 6 \times 6 \times 6 \times 6 \times 6 \quad (6^5) \\ & = 7776 \text{ outcomes} \end{aligned}$$

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13. A combination lock uses the numbers from
0 to 59. Three numbers are dialled in the
correct sequence. How many unique lock
combinations are possible

- a) if repetition is permitted?
b) if repetition is not permitted?

$$\begin{aligned} \text{a) } & 60 \text{ numbers} \\ & \Rightarrow 60 \times 60 \times 60 \\ & = 216,000 \\ & \text{combinations} \end{aligned}$$

$$\begin{aligned} \text{b) } & 1^{\text{ST}} = 60 \text{ numbers} \\ & 2^{\text{ND}} = 59 \text{ numbers} \\ & 3^{\text{RD}} = 58 \text{ numbers} \\ & \Rightarrow 60 \times 59 \times 58 \\ & = 205,320 \\ & \text{combinations} \end{aligned}$$

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15. Licence plates consist of letters and/or digits. Calculate the number of licence plates that could be formed in each province or territory. Assume all numbers and letters are possible.

- a) Ontario, with four letters followed by three digits
 b) Québec, with three letters followed by three digits
 c) Northwest Territories, with six digits

26 letters (A → Z)
 10 digits (0 → 9)

$$\begin{aligned} \text{a)} &= 26^4 \times 10^3 \\ &= 456,976,000 \end{aligned}$$

$$\begin{aligned} \text{c)} &= 10^6 \\ &= 1,000,000 \end{aligned}$$

$$\begin{aligned} \text{b)} &= 26^3 \times 10^3 \\ &= 17,576,000 \end{aligned}$$

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16. Alberta licence plates have three letters followed by four digits. Is this approximately the same number of licence plates as Ontario? Explain without calculating the total number of Alberta plates.

$$\begin{aligned} \text{Alberta} &= 26^3 \times 10^4 \quad [26^3 \times 10^3 \times 10] \\ \text{Ontario} &= 26^4 \times 10^3 \quad [26^3 \times 10^3 \times 26] \end{aligned}$$

⇒ Far fewer choices in Alberta.
 Multiplying by 26 will generate more options than multiplying by 10.

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21. **Application** Each question on a 10-question multiple choice test has four possible answers. In how many ways could the questions be answered if

- a) all questions must be answered?
- b) the student is permitted to leave answers blank?

a) 4 options each time for 10 questions
 $\Rightarrow 4^{10} = 1,048,576$ ways

b) 5 options each time [Blank, A, B, C, D]
 $= 5^{10} = 9,765,625$ ways

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