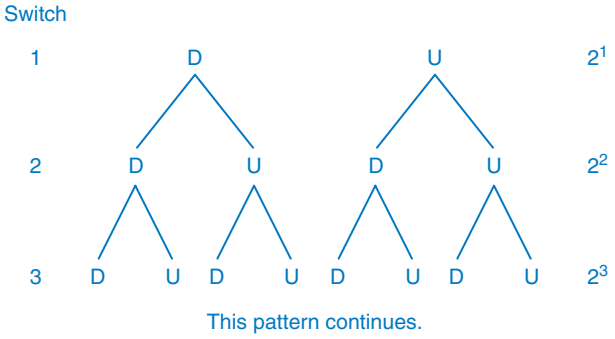
Checkpoint: Assess Your Understanding, pages 718–720

8.1

1. A garage door remote has 10 code switches. Each switch can be positioned up or down to create a wireless code. How many codes are possible?

Use a tree diagram.

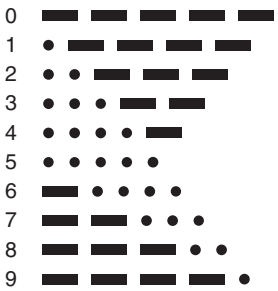


For 10 switches, there are 2^{10} or 1024 possible codes.

2. Multiple Choice A restaurant offers a meal combo that consists of a beverage, a main course, and a dessert. There are 5 beverages, 6 main courses, and 4 desserts. How many meal combos are available?

A. 15 **B.** 30 **C.** 20 **D.** 120

3. Morse code uses arrangements of 5 characters to represent the digits 0 through 9. Each character is either a dot or a dash. How many arrangements of 5 characters are possible?



There are 5 characters.
There are 2 choices for each character: dot or dash
So, the number of arrangements of 5 characters is: $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$

8.2

4. Multiple Choice How many 5-letter permutations of YUKON can be created?

A. 6 **B.** 24 **C.** 120 **D.** 3125

5. A family of six is to be seated in a row for a photo. The mother and father must be at either end. How many ways can the family be arranged?

There are 4 children. The number of ways to arrange 4 children is: $4! = 24$
There are 2 ways to arrange the mother and father: MF and FM
So, the number of ways the family can be arranged is: $2 \cdot 24 = 48$

6. An under-10 house-league soccer team has 11 players. Seven players are on the field at a time. How many ways can 7 starters be chosen from the members of the team?

Use the formula: ${}_nP_r = \frac{n!}{(n-r)!}$ Substitute: $n = 11, r = 7$

$${}_{11}P_7 = \frac{11!}{(11-7)!}$$
$$= \frac{11!}{4!}$$
$$= 1\,663\,200$$

There are 1 663 200 ways starters can be chosen.

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7. Solve each equation for n or r.

a) ${}_nP_2 = 42$

$${}_nP_2 = \frac{n!}{(n-2)!}$$
$$42 = \frac{n!}{(n-2)!}$$
$$42 = n(n-1)$$
$$0 = n^2 - n - 42$$
$$0 = (n-7)(n+6)$$
$n = 7$ or $n = -6$
Since n cannot be negative,
$n = 7$

b) ${}_7P_r = 840$

$${}_7P_r = \frac{7!}{(7-r)!}$$
$$840 = \frac{5040}{(7-r)!}$$
$$(7-r)! = \frac{5040}{840}$$
$$(7-r)! = 6$$
Since $3! = 6$, then
$$7 - r = 3$$
$$r = 4$$

8.3

8. **Multiple Choice** How many ways can 2 pennies, 3 nickels, and 5 quarters be arranged in a row?

A. 30 **B.** 2520 **C.** 5040 **D.** 3 628 800

9. What is the number of permutations of all the letters in the name of each provincial park?

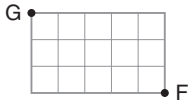
a) VERMILION

There are 9 letters.
2 are Is.
Number of permutations:
$$\frac{9!}{2!} = 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3$$
$$= 181\,440$$

b) OPAPISKAW

There are 9 letters.
2 are Ps and 2 are As.
Number of permutations:
$$\frac{9!}{2!2!} = \frac{9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot {}^{2}\cancel{4} \cdot 3}{\cancel{2}}$$
$$= 90\,720$$

10. How many ways are there to get from F to G travelling along grid lines and moving only to the left or up?



Total number of grid squares travelled: 8
Squares travelled left: 5; squares travelled up: 3
So, the number of ways to get from F to G is:
$$\frac{8!}{5!3!} = \frac{8 \cdot 7 \cdot \cancel{6}}{\cancel{6}}$$
$$= 56$$