Factorials

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. Evaluate $4!$. [2 marks]

$4! = 4 \times 3 \times 2 \times 1 = 24$.

Answer: 24.

2. Simplify $8!/6!$. [2 marks]

$8! = 8 \times 7 \times 6!$.

Answer: 56.

3. Evaluate $7!/(5!\,2!)$. [2 marks]

$7 \times 6/2 = 21$.

Answer: 21.

4. How many orders can 5 different runners finish in, assuming no ties? [2 marks]

$5! = 120$.

Answer: 120.

5. Solve $n! = 120$ for a non-negative integer n. [2 marks]

$4! = 24$, $5! = 120$, and factorials increase for integers at least 2.

Answer: n = 5.

6. Explain why $0!$ is 1 rather than 0 in the expression $5!/(5!\,0!)$. [3 marks]

With $0! = 1$, $5!/(5!\,0!) = 1$.

Using zero would cause division by zero and break the counting interpretation.

Answer: Choosing all 5 objects should have one possible selection, so the expression must be 1.