A BASIC COUNTING PRINCIPLES

A.1 APPLYING THE PRODUCT RULE

Ex 1: You have 3 t-shirts and 2 pairs of jeans. How many different outfits can you create by picking one t-shirt and one pair of jeans?

outfits

Ex 2: You are at an ice cream shop with 5 flavors of ice cream and 2 types of toppings. How many different desserts can you create by picking one ice cream flavor and one topping?

desserts

Ex 3: Su is creating a 4-digit PIN for his debit card. Each digit can be any number from 0 to 9, and digits can be repeated. His PIN starts with 94.

9 4

How many different PINs are possible for the remaining two digits?

PINs

Ex 4: A headteacher wants to select one student from Year 4 and one student from Year 5 for an interview. There are 20 students in Year 4 and 18 students in Year 5. How many different pairs of students can be chosen?

pairs

Ex 5: You are packing for a trip with 2 pairs of shoes, 3 pairs of pants, and 5 t-shirts. How many different outfits can you create by picking one of each item?

outfits

A.2 APPLYING THE ADDITION RULE

Ex 6: A student can choose a new computer from either 3 desktop models or 4 laptop models. What is the total number of computer options?

options

Ex 7: To travel from Paris to Lyon, a traveler can choose from 6 different high-speed trains or 2 flights. How many different travel options does the traveler have for their journey?

options

Ex 8: A film enthusiast wants to watch a movie. They subscribe to two streaming services. Service A has 8 exclusive action movies, and Service B has 5 exclusive comedy movies. How many different movies can they choose to watch?

movies

Ex 9: A community center offers weekend workshops. On Saturday, there are 3 painting workshops and 2 pottery workshops. On Sunday, there are 4 creative writing workshops. If a person can only sign up for one workshop for the entire weekend, how many choices do they have?

choices

B FACTORIALS

B.1 EVALUATING WITHOUT A CALCULATOR

Ex 10: Evaluate:

 $3! = \boxed{}$

Ex 11: Evaluate:

4! =

Ex 12: Evaluate:

5! =

Ex 13: Evaluate:

6! =

B.2 EVALUATING WITH A CALCULATOR

Ex 14: Evaluate:

7! =

Ex 15: Evaluate

 $\frac{8!}{3!} =$

Ex 16: Evaluate:

 $\frac{9!}{3!6!} = \Box$

Ex 17: Evaluates

 $\binom{20}{17} = \boxed{}$

Ex 18: Evaluate

 $\binom{15}{10} = \boxed{}$

B.3 EXPRESSING PRODUCTS IN FACTORIAL FORM

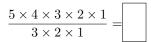
Ex 19: Express in factorial form:

 $\frac{4 \times 3 \times 2 \times 1}{2 \times 1} = \boxed{}$

Ex 20: Express in factorial form:

 $4 \times 3 =$

Ex 21: Express in factorial form:



Ex 22: Express in factorial form:

$$5 \times 4 =$$

Ex 23: Express in factorial form:

$$\frac{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{4 \times 3 \times 2 \times 1} = \boxed{}$$

Ex 24: Express in factorial form:

$$7 \times 6 \times 5 =$$

B.4 EVALUATING BY SIMPLIFICATION

Ex 25: Evaluate

$$\binom{5}{3} = \boxed{}$$

Ex 26: Evaluate

$$\binom{6}{4} = \square$$

Ex 27: Evaluate

$$\binom{7}{2} = \square$$

Ex 28: Evaluate

$$\binom{7}{4} = \boxed{}$$

C ORDERED DRAWS WITH REPLACEMENT (P-LISTS)

C.1 SOLVING REAL-WORLD PROBLEMS

Ex 29: A suitcase lock requires a 3-digit code, with each digit ranging from 0 to 9. How many different codes are possible?



Ex 30: A mobile phone requires a 4-digit PIN, with each digit ranging from 0 to 9. How many different PINs can be created?



Ex 31: You are taking a 5-question True/False test. How many different ways can you answer the entire test?



Ex 32: A multiple-choice test has 20 questions, and each question has 3 answer choices (A, B, or C). How many different answer keys are possible?

answer	kevs
0.220 11 02	11030

D ORDERED DRAWS WITHOUT REPLACEMENT (ARRANGEMENTS)

D.1 SOLVING REAL-WORLD PROBLEMS

Ex 33: You're watching a race with 20 competitors, and the top three finishers will stand on the podium. How many different podiums (first, second, and third place) are possible?

	podiums
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Ex 34: You're organizing a group photo and need to arrange 5 people in a single row. How many different ways can you line them up?

ways

Ex 35: You're watching a race with 20 competitors, including Emile. How many different possible podiums (first, second, and third place) are there if Emile must finish in first place?

podium

Ex 36: You're watching a race with 20 competitors, including Emile. How many different podiums are possible if Emile must be one of the three podium finishers?

	podiums
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MCQ 37: Mr. T has 5 algebra books, 3 geometry books, and 4 analysis books. In how many ways can he arrange them on a shelf if he groups them by subject?

- $\Box 12^{12}$
- \square 3! \times 5! \times 3! \times 4!
- \Box 5! × 3! × 4!
- \square 12!

E UNORDERED DRAWS WITHOUT REPLACEMENT (COMBINATIONS)

E.1 SOLVING REAL-WORLD PROBLEMS

Ex 38: You are on a sports team with 5 players: P, Q, R, S, and T. How many different teams of 2 players can be formed?

	teams

Ex 39: You are part of a squad with 6 players. How many different teams of 4 players can be formed?



Ex 48: A one pair hand has two cards of one rank, and three other cards of three different ranks. How many are possible?
hands
G APPLICATIONS TO PROBABILITY
Ex 49: A student council has 10 members: 6 seniors and 4 juniors. A 3-person committee is to be selected at random. What is the probability that the committee will consist entirely
of seniors?
Ex 50: In a race with 20 horses, you bet on 3 horses to finish first, second, and third in exact order (a "triple forecast"). What's the probability of winning your bet?
Ex 51: In a race with 20 horses, you bet on 3 horses to finish in the top 3 positions in any order (a "trio" bet). What's the probability of winning your bet?

Ex 52: In Lotto, you pick 6 numbers from a grid of 49.
What is the probability of winning the jackpot by matching all
6 numbers?
Ex 53: In Lotto, you pick 6 numbers from a grid of 49.
What is the probability of matching exactly 5 of the 6 winning
numbers?
Ex 54: In a class of 30 students, what is the probability
that at least two students share the same birthday? Assume a
year has 365 days and birthdays are equally likely.