

Math 30-1: Permutations and Combinations

PRACTICE EXAM

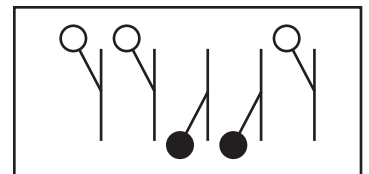
1. The expression $\frac{n!}{(n-2)!}$ is equivalent to:
- A. $n^2 - n$
- B. $\frac{1}{n^2 - n}$
- C. n
- D. $(n+1)!$
2. A Grade 12 student is taking Biology, English, Math, and Physics in her first term. If a student timetable has room for five courses (*meaning the student has a spare*), how many ways can she schedule her courses?

One Possible Timetable

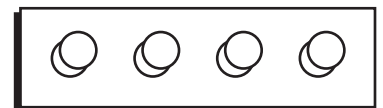
Block	Course
Block 1	Math 30-1
Block 2	Spare
Block 3	Physics 30
Block 4	English 30-1
Block 5	Biology 30

- A. 24
- B. 120
- C. 240
- D. 720
3. An electrical panel has five switches. How many ways can the switches be positioned up or down if three switches must be up and two must be down?

One possible switch arrangement.



- A. 10
- B. 24
- C. 48
- D. 120
4. A coat hanger has four knobs, and each knob can be painted any color. If six different colors of paint are available, how many ways can the knobs be painted?

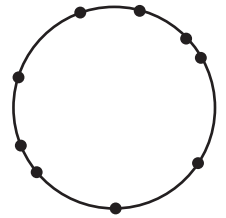


- A. 24
- B. 360
- C. 720
- D. 1296

5. How many ways can the letters from the word TREES be ordered such that each “word” starts with a consonant and end with a vowel?
- A. 9
B. 18
C. 24
D. 27
6. How many arrangements of the word ACTIVE are there if C&E must always be together?
- A. 48
B. 120
C. 240
D. 720
7. Eight cars (3 red, 3 blue, and 2 yellow) are to be parked in a line. How many unique lines can be formed if the yellow cars must not be together? Assume that cars of each color are identical.
- A. 18
B. 420
C. 560
D. 5040
8. How many 3-digit odd numbers greater than 600 can be formed using the digits (2, 3, 4, 5, 6, and 7)?
- A. 20
B. 36
C. 120
D. 720
9. The equation $\frac{n!}{10} = {}_{n-1}P_{n-3}$ has the solution:
- A. $n = 5$
B. $n = 6$
C. $n = 7$
D. $n = 8$

10. There are 9 dots randomly placed on a circle.
How many triangles can be formed within the circle?

A. 84
B. 120
C. 720
D. 60480

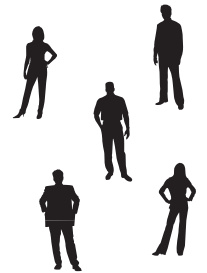


11. A crate of toy cars contains 10 working cars and 4 defective cars.
How many ways can 5 cars be selected if only 3 work?

A. 6
B. 56
C. 720
D. 3003

12. A committee of 5 people is to be formed from a selection pool of 12 people. If Carmen must be on the committee, how many unique committees can be formed?

A. 60
B. 330
C. 462
D. 792



13. How many five-letter words using letters from TRIANGLE can be made if the five-letter word must have two vowels and three consonants?

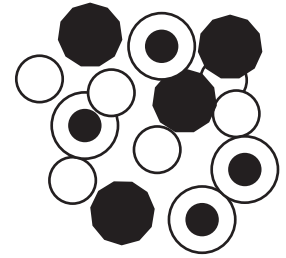
A. 56
B. 3360
C. 3600
D. 6720

14. Twelve people at a party shake hands once with everyone else in the room.
How many handshakes took place?

A. 66
B. 132
C. $12! \div 2$
D. $12!$

15. A jar contains quarters, loonies, and toonies. If four coins are selected from the jar, how many unique coin combinations are there?

- A. 15
- B. 18
- C. 21
- D. 24



16. From a deck of 52 cards, a 5-card hand is dealt. How many distinct hands can be formed if there are at most 2 queens?

- A. 103776
- B. 882096
- C. 2594400
- D. 2598960

17. In how many ways can you choose one or more of 5 different candies?

- A. 16
- B. 25
- C. 31
- D. 32

18. The solution to $\binom{n}{3} = 10$ is:

- A. $n = 2$
- B. $n = 3$
- C. $n = 4$
- D. $n = 5$

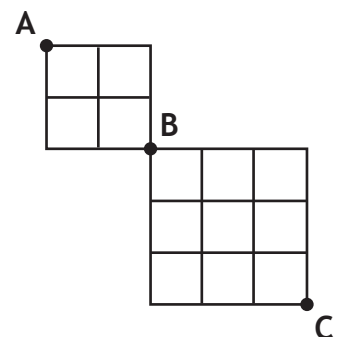
19. The solution to $\frac{{}^n C_4}{{}^{n-2} C_2} = 1$ is:

- A. $n = 2$
- B. $n = 3$
- C. $n = 4$
- D. $n = 5$

20. If there are three cars and four motorcycles, how many ways can the vehicles park in a line such that cars and motorcycles alternate positions?
- A. 35
 B. 70
 C. 144
 D. 5040
21. There are nine people participating in a raffle. Three \$50 gift cards from the same store are to be given out as prizes. How many ways can the gift cards be awarded?
- A. 84
 B. 504
 C. 720
 D. 60480
22. A set of tiles contains eight letters, A - H. If two of these sets are combined, how many ways can all the tiles be arranged?
- A. $16!$
 B. $\frac{16!}{8 \times 2!}$
 C. $\frac{16!}{8!}$
 D. $\frac{16!}{(2!)^8}$

23. Moving only south and east, how many unique pathways connect points A and C?

- A. 9
 B. 36
 C. 84
 D. 120



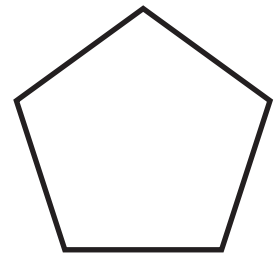
24. A bookshelf has n fiction books and six non-fiction books. If there are 150 ways to choose two books of each type, how many fiction books are on the bookshelf?
- A. 5
 B. 6
 C. 7
 D. 8
25. A particular college in Alberta has a list of approved pre-requisite courses:

Math	Science	English	Other
Math 30-1 or Math 30-2	Biology 30 Chemistry 30 Physics 30	English 30-1	Option A Option B Option C Option D Option E

- Five courses are required for admission to the college. Math 30-1 (or Math 30-2) and English 30-1 are mandatory requirements, and at least one science course must be selected as well. How many different ways could a student select five courses on their college application form?
- A. 88
 B. 90
 C. 92
 D. 94
26. If a 5-card hand is dealt from a deck of 52 cards, how many hands have cards that are all the same color?
- A. 32890
 B. 65780
 C. 131560
 D. 263120
27. A multiple choice test contains 5 questions, and each question has four possible responses. How many different answer keys are possible?
- A. 20
 B. 120
 C. 256
 D. 1024

28. The number of diagonals in a pentagon is:

- A. 5
- B. 6
- C. 7
- D. 8



29. How many ways can eight books, each covering a different subject, be arranged on a shelf such that books on biology, history, or programming are never together?

- A. 6720
- B. 14400
- C. 36000
- D. 40314

30. Five different types of fruit and six different types of vegetables are available for a healthy snack tray. The snack tray is to contain two fruits and three vegetables. How many different snack trays can be made if blueberries or carrots must be served, but not both together?

- A. 100
- B. 120
- C. 140
- D. 160

31. In genetics, a codon is a sequence of three letters that specifies a particular amino acid. A fragment of a particular protein yields the amino acid sequence:

Met - Gly - Ser - Arg - Cys - Gly.

How many unique codon arrangements could yield this amino acid sequence?

- A. 1150
- B. 1152
- C. 1154
- D. 1156

Amino Acid	Codon(s)
Arginine (Arg)	CGU, CGC, CGA, CGG, AGA, AGG
Cysteine (Cys)	UGU, UGC
Glycine (Gly)	GGU, GGC, GGA, GGG
Methionine (Met)	AUG
Serine (Ser)	UCU, UCC, UCA, UCG, AGU, AGC

32. The third term in row 22 of Pascal's Triangle is:

A. ${}_{21}C_2$

B. ${}_{21}C_3$

C. ${}_{22}C_2$

D. ${}_{22}C_3$

33. Which of the following is not a term in the expansion of $(2x - 3)^4$?

A. $16x^4$

B. $-96x^3$

C. $-216x^2$

D. $-216x$

34. Which of the following is not a term in the expansion of $\left(3x^2 - \frac{1}{2}\right)^4$?

A. $81x^8$

B. $-54x^6$

C. $-\frac{3}{2}x^4$

D. $\frac{1}{16}$

35. The expression $32a^5 - 240a^4b + 720a^3b^2 - 1080a^2b^3 + 810ab^4 - 243b^5$ is equivalent to:

A. $(2a - 3b)^3$

B. $(2a - 3b)^4$

C. $(2a - 3b)^5$

D. $(2a - 3b)^6$

36. The fifth term in the expansion of $(3a^3 - 2b^2)^8$ is:

A. $-90720a^{12}b^8$

B. $90720a^{12}b^8$

C. $-48384a^9b^{10}$

D. $48384a^9b^{10}$

37. In the expansion of $(5a - 2b)^9$, the coefficient of the term containing a^5 is:

- A. -2520000
- B. 2520000
- C. -6300000
- D. 6300000

38. If there are 23 terms are in the expansion of $(a - 2)^{3k-5}$, the value of k is:

- A. 8
- B. 9
- C. 10
- D. 11

39. A term in the expansion of $(ma - 4)^5$ is $-5760a^2$. What is the value of m ?

- A. -3
- B. 3
- C. -5
- D. 5

40. In the expansion of $\left(2x^2 - \frac{1}{x}\right)^6$, the constant term is:

- A. -30
- B. 30
- C. -60
- D. 60

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Permutations and Combinations Practice Exam - ANSWER KEY
Video solutions are in italics.

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|--|--|
| 1. A <i>Permutations, Example 2g</i> | 21. A <i>Combinations, Example 12f</i> |
| 2. B <i>Permutations, Example 3a</i> | 22. D <i>Combinations, Example 13a</i> |
| 3. A <i>Permutations, Example 4f</i> | 23. D <i>Combinations, Example 13e</i> |
| 4. D <i>Permutations, Example 5c</i> | 24. A <i>Combinations, Example 14b</i> |
| 5. B <i>Permutations, Example 7b</i> | 25. C <i>Combinations, Example 14e</i> |
| 6. C <i>Permutations, Example 8b</i> | 26. C <i>Combinations, Example 15c</i> |
| 7. B <i>Permutations, Example 9b</i> | 27. D <i>Combinations, Example 15e</i> |
| 8. A <i>Permutations, Example 10c</i> | 28. A <i>Combinations, Example 15f</i> |
| 9. A <i>Permutations, Example 12c</i> | 29. B <i>Combinations, Example 15g</i> |
| 10. A <i>Combinations, Example 2d (ii)</i> | 30. A <i>Combinations, Example 16c</i> |
| 11. C <i>Combinations, Example 3b</i> | 31. B <i>Combinations, Example 16d</i> |
| 12. B <i>Combinations, Example 4a</i> | 32. A <i>The Binomial Theorem, Example 2b</i> |
| 13. C <i>Combinations, Example 5a</i> | 33. C <i>The Binomial Theorem, Example 4c</i> |
| 14. A <i>Combinations, Example 6a</i> | 34. C <i>The Binomial Theorem, Example 5b</i> |
| 15. A <i>Combinations, Example 7a</i> | 35. C <i>The Binomial Theorem, Example 6b</i> |
| 16. C <i>Combinations, Example 8b</i> | 36. B <i>The Binomial Theorem, Example 7b</i> |
| 17. C <i>Combinations, Example 8e</i> | 37. D <i>The Binomial Theorem, Example 8a</i> |
| 18. D <i>Combinations, Example 10c</i> | 38. B <i>The Binomial Theorem, Example 8d</i> |
| 19. C <i>Combinations, Example 11a</i> | 39. B <i>The Binomial Theorem, Example 9a</i> |
| 20. C <i>Combinations, Example 12d</i> | 40. D <i>The Binomial Theorem, Example 10a</i> |

Math 30-1 Practice Exam: Tips for Students

- Every question in the practice exam has already been covered in the Math 30-1 workbook. It is recommended that students refrain from looking at the practice exam until they have completed their studies for the unit.
- Do not guess on a practice exam. The practice exam is a self-diagnostic tool that can be used to identify knowledge gaps. Leave the answer blank and study the solution later.