

Permutations and Combinations Lesson #8: Practice Test

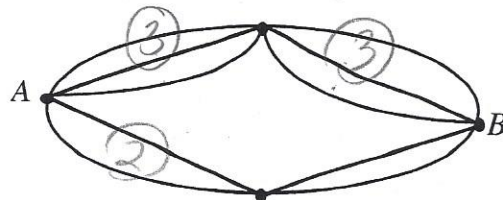
Section A

No calculator may be used for this section of the test.

1. How many routes are there from A to B if each route must always move closer to B?

- A. 10
 B. 13
 C. 24
 D. 36

$\frac{3}{9} \frac{3}{4}$ or $\frac{2}{2}$
 $9 + 4$



2. The number of arrangements of all of the letters of the word **HOCKEY** is

- A. 6
 B. 21
 C. 120
 D. 720

$6! = 720$

3. A committee consists of eleven elected members. From this committee, a President, a Treasurer, and a Secretary have to be chosen. In how many ways can this be done?

- A. ${}_{11}P_3$ B. ${}_{11}C_3$ C. 11^3 D. $\frac{11!}{3!}$

order matters, assigned roles.

4. Six children and five adults are to be seated in a row so that none of the children sits beside another child. The number of different ways in which this can be done is

- A. $11!$
 B. $6! \times 5!$
 C. ${}_{11}C_6 \times {}_5C_5$
 D. ${}_6C_6 \times {}_5C_5$

$C \ A \ C \ A \ C \ A \ C \ A \ C \ A \ C$
 $6! \times 5!$
 children adults

Numerical Response

1. A car dealership has **5 different** models of car in the showroom. The 5 cars are to be displayed in a straight line. Three of the cars are blue, one is black and one is green.

The number of ways in which all of the cars can be displayed in the showroom if no two blue cars can be next to one another is _____.

(Record your answer in the numerical response box from left to right.)

1	2		
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B B B

$3! \cdot 2!$
 Blue

5. An alternative form of the expression $\frac{(n+2)!}{n(n-1)!}$ is

A. $(n+2)(n+1)$

B. $\frac{(n+2)(n+1)}{(n-1)}$

C. $\frac{(n+2)(n+1)}{n}$

D. $\frac{(n+2)(n+1)}{(n-1)!}$

$$\frac{(n+2)(n+1)(n)(n-1)!}{n(n-1)!}$$

Section B

A graphing calculator may be used for the remainder of the test.

6. The number of different 6-letter permutations of all of the letters in the word BANANA is

A. 60

B. 120

C. 144

D. 720

$$\frac{6!}{3!2!}$$

7. The schedule in a soccer league consists of each team playing every other team twice. If there are six teams in the league, the total number of games on the schedule is

A. 60

B. 36

C. 30

D. 15

$$6P_2 = 30$$

8. A committee of 6 students is to be selected from 5 boys and 6 girls. How many different committees are possible if there must be an equal number of boys and girls on the committee?

A. ${}_{11}C_6$

B. ${}_5C_3 \times {}_6C_3$

C. ${}_{11}C_3 \times {}_6C_3$

D. ${}_5C_1 \times {}_6C_1$

$$\frac{{}_3B \cdot {}_3G}{({}_5C_3)({}_6C_3)}$$

Numerical Response

2. A computer access code consists of three different digits followed by one of the letters A, B, C, or D.

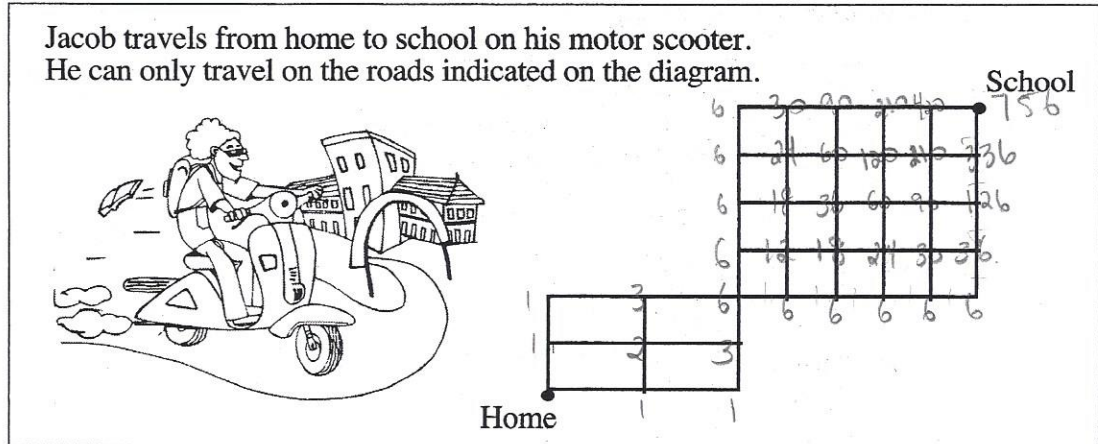
If the first digit in the access code cannot be zero, then the number of different access codes possible is _____.

(Record your answer in the numerical response box from left to right.)

2	5	9	2
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9 9 8 4
not 0.

Use the following information to answer the next question.



9. The number of different routes he can take without backtracking is

- A. 132
- B. 756**
- C. 1716
- D. 9240

or

$$\frac{4!}{2!2!} \times \frac{9!}{5!4!}$$

$\frac{420}{756}$
 $\frac{336}{756}$

10. The number of ways that an executive committee consisting of prime minister, deputy prime minister, treasurer, and secretary can be chosen from 16 student council members is

- A. $4!$
- B. $\frac{16!}{4!}$
- C. $\frac{16!}{12!4!}$
- D. $\frac{16!}{12!}$**

$$\frac{n!}{(n-r)!} \quad 16P_4 = \frac{16!}{(16-4)!} = \frac{16!}{12!}$$

11. Al's Pizza is to expand its operation by opening 4 new stores in Calgary, 1 new store in Red Deer, and 3 new stores in Edmonton.

If there are 6 possible locations in Calgary, 4 possible locations in Red Deer, and 4 possible locations in Edmonton, then the number of ways in which the 8 different locations can be chosen is

- A. 12
- B. 165
- C. 240**
- D. 34 560

$$6C_4 \times 4C_1 \times 4C_3 = 15(4)(4) = 240$$

Numerical Response 3.

The "special" menu at a fast food restaurant allows you to choose one sandwich, one drink and one cookie for a price of \$5.99. The choices available are shown in the table.

Sandwich	Drink	Cookie
Ham	Orange	Chocolate Chip
Beef	Milk	Coconut
Turkey	Cola	(5)
Tuna	(3)	
Chicken Salad		
(5)		

The number of different ways that a student can choose a meal from the special menu, consisting of one sandwich, one drink, and one cookie, is _____.

(Record your answer in the numerical response box from left to right.)

3	0		
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5 3 2

12. The area codes in a country all contain three digits from the digits 1 to 9. Which of the following restrictions will result in the most area codes? (9)

A. The digits are all different. $9 \cdot 8 \cdot 7 = 504$

B. The middle digit must be odd. $9 \cdot 5 \cdot 9 = 405$

(C) The digit 7 cannot be used. $8 \cdot 8 \cdot 8 = 512$

D. All the digits are even, or all the digits are odd. $\frac{4 \cdot 4 \cdot 4}{\text{even}} + \frac{5 \cdot 5 \cdot 5}{\text{odd}} = 189$

13. A 5-card hand is dealt from a standard deck of 52 playing cards. The number of different hands containing 4 diamonds and 1 spade is

(A) 9 295

B. 18 590

C. 223 080

D. 1 115 400

$$(13^C_4)(13^C_1)$$

Numerical Response

4. If $\frac{n!}{(n-2)!} = 240$, the value of n is _____.

(Record your answer in the numerical response box from left to right.)

1	6		
---	---	--	--

$$\frac{n(n-1)(n-2)!}{(n-2)!} = 240$$

$$n^2 - 1n = 240$$

$$n^2 - 1n - 240 = 0$$

$$(n-16)(n+15) = 0$$

$$n = 16, -15$$

14. Rajinder and six of his friends are in a line-up to buy tickets for a movie. The number of ways in which they can line up if Rajinder is first in the line is

- A. 20
- B. 120
- C. 720
- D. 5040

$$R | 6! = \dots$$

15. If all of the letters in the word **FLAGPOLE** are used, then the number of different 8-letter arrangements that can be made ending with 3 vowels is

- A. 4320
- B. 720
- C. 360
- D. 120

$$\frac{5!}{2!} = \dots$$

3	2	1
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Numerical Response

5. There are eight visible points on the circle shown. The number of different triangles which can be made using these eight points is _____.



(Record your answer in the numerical response box from left to right.)

5	6		
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$${}^8C_3 = 56$$

16. Ten students in a leadership class at Memorial High School are going to do some volunteer work. Five of the students will volunteer at the Food Bank, two of the students will volunteer at the Central Hospital and the remaining three students will volunteer at Memorial Elementary School.

The number of ways in which the ten students can be assigned to these three locations is

- A. 417
 B. 2520
 C. 845 020
 D. 1 360 800

$$10^C_5 \times 5^C_2 \times 3^C_3 = 2520$$

food bank hospital school

17. The number of 7-letter arrangements of all of the letters of the word **SAILING** in which all the vowels are together is

- A. 72
 B. 144
 C. 360
 D. 720

2 I

A I I

 _ _ _ _

$$\frac{3! \cdot 5!}{2!} = 360$$

18. How many arrangements of all of the letters in the word **NOISE** are possible if the vowels, **E, I, and O**, must be together but not necessarily in that order?

- A. 6
 B. 12
 C. 18
 D. 36

E I O

 _ _

$$\frac{3! \cdot 3!}{1} = 36$$

19. A Graduation Committee of 6 students is to be selected from the 4 males and 6 females on the Student Council. How many Graduation Committees are possible if the President of the Student Council, who is female, must be on the committee?

- A. 84
 B. 126
 C. 210
 D. 252

4+6 = 10

10 students - only need 9 more

president + 9 more

$$9^C_5 = 126$$

20. Mr. and Mrs. LaMarre want a family photograph taken with their four children. In how many ways can the family stand in a straight line if the parents must occupy the two middle positions in the line? (6pp)

- A. 4
- B. 24
- C. 48**
- D. 120

$_ _ _ _$
 $_ _ _ _ _ _$
 $_ _ _ _ _ _$
 $_ _ _ _ _ _$
 4! × 2!
 Children parents

Numerical Response

6. If ${}_nP_3 = 990$, then the value of ${}_nC_3$ is _____.

(Record your answer in the numerical response box from left to right.)

1	6	5	
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① solve for "n" use guess + check
 ${}_nP_3 = 990$ $n = 11$
 so ${}_{11}C_3 = 165$

Written Response

1. The Riverview High School Games Club meets once a week to play a variety of card and board games. The club currently has 14 male and 16 female members.
 - Four members of the club are selected to play the card game Euchre. How many ways can those four players be selected from the 30 members of the club?

${}_{30}C_4 = 27405$

- The game of Euchre only uses 24 cards from a standard deck. All cards are removed, except the 9's, 10's, jacks, queens, kings, and aces, which are used for the game. How many five card hands of Euchre can be dealt that have exactly 2 red cards?

12 red choose 2 ${}_{12}C_2$
 12 black choose 3 ${}_{12}C_3$
 $({}_{12}C_2)({}_{12}C_3) = \underline{14520}$

Written Response

2. Phil is a golf professional at a local private golf course. He owns many golf clubs, and will choose the clubs he uses to play a particular round of golf based on weather conditions, course conditions, and course length. His clubs are categorized by drivers, fairway woods, irons, wedges, and putters. The chart below shows the golf clubs Phil currently owns.

Drivers (3)	Fairway Woods (4)	Irons (8)	Wedges (4)	Putters (3)
11° loft	3 wood	2 iron	60° lob wedge	Blade putter
10° loft	5 wood	3 iron	56° sand wedge	Mallet putter
8.5° loft	7 wood	4 iron	52° gap wedge	2-ball putter
(3)	9 wood	5 iron	48° pitching wedge	
		6 iron		
		7 iron		
		8 iron		
		9 iron		

- Phil is giving a golf lesson today, and he will take one driver, one iron, and one wedge to the driving range. In how many ways can he select the three clubs he will use for the lesson?

$$\begin{array}{r} 3 \quad 8 \quad 4 \\ \hline \end{array} = 96$$

driver iron wedge

- One of the official rules of golf states, "The player must start a stipulated round with not more than 14 clubs." Before each round, Phil must choose the 14 clubs he will use for that round. For tomorrow's round, Phil will choose 1 driver, 3 fairway woods, 6 irons, 3 wedges and his mallet putter. In how many ways can Phil choose the 14 golf clubs he will use in tomorrow's round?

$$(3C_1) (4C_3) (8C_6) (4C_3) + \text{putter} = 1344$$

driver fairway woods irons wedge

Answer Key

Multiple Choice

1. B 2. D 3. A 4. B 5. A 6. A 7. C 8. B
 9. B 10. D 11. C 12. C 13. A 14. C 15. C 16. B
 17. C 18. D 19. B 20. C

Numerical Response

1.

1	2		
---	---	--	--

 2.

2	5	9	2
---	---	---	---

 3.

3	0		
---	---	--	--

 4.

1	6		
---	---	--	--

 5.

5	6		
---	---	--	--

 6.

1	6	5	
---	---	---	--

Written Response

1. • 27 405 2. • 96
 • 14 520 • 1344