Probability Test Review

Express each of the expressions in factorial form.

1) ${}_{10}P_3$ 2) ${}_8P_5$ 3) ${}_9C_7$ 4) ${}_6C_2$ 5) $\binom{9}{2}$ 6) $\binom{10}{7}$

1) $\frac{10!}{(10-3)!} = \boxed{\frac{10!}{7!}}$ 2) $\frac{8!}{(8-5)!} = \boxed{\frac{8!}{3!}}$ 3) $\frac{9!}{7!(9-7)!} = \boxed{\frac{9!}{7!2!}}$

4) $\frac{6!}{2!(6-2)!} = \boxed{\frac{6!}{2!4!}}$ 5) $\frac{9!}{2!(9-2)!} = \boxed{\frac{9!}{2!7!}}$ 6) $\frac{10!}{7!(10-7)!} = \boxed{\frac{10!}{7!3!}}$

Evaluate each expression. Express your answer as a number.

7) ${}_5P_3$ 8) ${}_4P_2$ 9) ${}_6C_3$ 10) ${}_8C_4$

7) $\frac{5!}{(5-3)!} = \frac{5!}{2!} = \frac{5\cdot4\cdot3\cdot2\cdot1}{2\cdot1} = \boxed{60}$ 8) $\frac{4!}{(4-2)!} = \frac{4!}{2!} = \frac{4\cdot3\cdot2\cdot1}{2\cdot1} = \boxed{12}$

9) $\frac{6!}{3!(6-3)!} = \frac{6!}{3!3!} = \frac{6\cdot5\cdot4\cdot3\cdot2\cdot1}{3\cdot2\cdot1\cdot3\cdot2\cdot1} = \boxed{20}$

10) $\frac{8!}{4!(8-4)!} = \frac{8!}{4!4!} = \frac{8\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{4\cdot3\cdot2\cdot1\cdot4\cdot3\cdot2\cdot1} = \boxed{70}$

11) What does it mean for 2 events to be independent? Give an example of 2 events which are independent of one another.

- They do not effect each other. Ex. flipping coins, rolling dice

12) What does it mean for 2 events to be dependent? Give an example of 2 events which are dependent to one another.

- They do effect each other. Ex. chosing marble, no replacement.

13) What does it mean for 2 events to be mutually exclusive? Give an example of 2 events which are mutually exclusive to one another.

- do not occur at same time Ex. odd/even boy/girl 3/4 (cannot)

Problems 14-17: A jar contains 5 blue marbles, 4 white marbles, and 3 red marbles. One marble is drawn at random.

14) What is the probability that the selected marble is white?
15) What is the probability that the selected marble is black?
16) What is the probability that the selected marble is blue or red?
17) What is the probability that the selected marble is red, white, or blue?

14) $\frac{4}{12} = \boxed{\frac{1}{3}}$

15) $\frac{0}{12} = \boxed{0}$ or 0%

16) $\frac{5}{12} + \frac{3}{12} = \frac{8}{12} = \boxed{\frac{2}{3}}$

17) $\frac{5}{12} + \frac{4}{12} + \frac{3}{12} = \frac{12}{12} = \boxed{1}$ or 100%

18) There is a 10% chance that it will rain Monday and a 60% chance that it will rain on Tuesday. What is the probability that it will **NOT** rain on either of the two days?

90% → .90 × .40 ← 40%

.90
× .40
00
3600
.3600 → 36%

Problems 19-22: A jar contains 6 green marbles, 2 yellow marbles, and 4 purple marbles. Two marbles are drawn from the jar, one at a time.

19) What is the probability that the first marble selected is green and the second marble selected is purple? Assume there is replacement of the first marble.

20) What is the probability that the first marble selected is yellow and the second marble selected is green? Assume there is **NOT** replacement of the first marble.

21) What is the probability that both marbles selected are purple? Assume there is **NOT** replacement of the first marble.

22) What is the probability that both marbles selected are green? Assume there is replacement of the first marble.

19) $\frac{6}{12} \cdot \frac{4}{12} = \frac{1}{2} \cdot \frac{1}{3} = \boxed{\frac{1}{6}}$

20) $\frac{2}{12} \cdot \frac{6}{11} = \frac{1}{6} \cdot \frac{6}{11} = \boxed{\frac{1}{11}}$

21) $\frac{4}{12} \cdot \frac{3}{11} = \frac{1}{3} \cdot \frac{3}{11} = \boxed{\frac{1}{11}}$

22) $\frac{6}{12} \cdot \frac{5}{12} = \frac{1}{2} \cdot \frac{5}{12} = \boxed{\frac{5}{24}}$

23) A three-person committee is chosen at random from a group of 8 people. How many different committees are possible?

$${}_8C_3 = \frac{8!}{3!(8-3)!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1 \; 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \boxed{56}$$

24) Nine people made the basketball team. How many different five-member teams are possible?

$${}_9C_5 = \frac{9!}{5!(9-5)!} = \frac{9!}{5!4!} = \frac{9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \boxed{126}$$

$$\begin{array}{r} 18 \\ \times 7 \\ \hline 126 \end{array}$$

note ↳ $0! = 1$

25) How many 4-letter permutations can be made from the letters in the word "MATH"?

$${}_4P_4 = \frac{4!}{(4-4)!} = \frac{4!}{0!} = 4! = 4 \cdot 3 \cdot 2 \cdot 1 = \boxed{24}$$

26) How many 3-letter permutations can be made from the letters in the word "KNIFE"?

$${}_5P_3 = \frac{5!}{(5-3)!} = \frac{5!}{2!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = \boxed{60}$$

27) One room in a house will get new carpeting, drapes, and paint. There is a choice of 4 carpets, 6 drapes, and 3 colors of paint. How many different ways can this room be decorated?

$$4 \cdot 6 \cdot 3 = \boxed{72}$$

$$\begin{array}{r} 24 \\ \times 3 \\ \hline 72 \end{array}$$

28) When Peter went to go buy a car, he had a choice of 3 kinds of seats, 4 kinds of music systems, and 5 colors of carpeting. How many different seat-music system-carpeting selections were available to him?

$$3 \cdot 4 \cdot 5 = \boxed{60}$$

29) If $P(A) = 0.25$, what is $P(A')$?

$$P(A') = 1 - P(A)$$
$$= 1 - 0.25$$
$$= \boxed{.75}$$

30) If $P(A) = \frac{4}{5}$, what is $P(A')$?

$$P(A') = 1 - P(A)$$
$$= 1 - \frac{4}{5}$$
$$= \boxed{\frac{1}{5}}$$

31) What is the probability of flipping a coin 3 times and getting heads each time?

← Independent

$$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{1}{8}}$$

32) A die is rolled twice. What is the probability of getting an even number on the first roll and a three or four on the second roll?

33) Ed wants to create a 4-character password. He wants to use arrangements of the 2 letters of his first name for the first 2 characters followed by 2 digits from the year 1985. How many different passwords are possible? (Repetition of letters and digits is allowed.)

$\underline{2} \cdot \underline{2} / \underline{4} \cdot \underline{4} = \boxed{64}$

Ed ↑ 1985 ↑

34) Mary wants to create 3-character screen names. She wants to use arrangements of the 4 letters of her first name for the first 2 characters followed by 1 digit from the number 517. How many different screen names can be created in this way? (Repetition of letters and digits is **NOT** allowed.)

↖ NOT !

$\underline{4} \cdot \underline{3} / \cdot \underline{3} = \boxed{36}$

Mary ↑ 517

↳ So, sorry about the wasted space (wasted paper). Let me take this opportunity to let you know that the "Study Guide" is posted to Instagram, also that if on the test you write your name backs, like Ennamiris is Sirimanne, then you'll get ten points extra in your homework category. Happy studying :)

Problems 35 - 38: A box contains 3 large math books, 4 large science books, 2 small math books, and 1 small science book. One book is taken out of the box at random.

35) What is the probability that it will be a math book?
36) What is the probability that it will be a science book given that it is a large book?
37) What is the probability that it will be a math book or a small book?
38) What is the probability that it will be a science book and a large book?

35) $\frac{5}{10} = \boxed{\frac{1}{2}}$

36) Don't care about small books. $\boxed{\frac{4}{7}}$

37) "OR" $\frac{5}{10}$ (math) $+ \frac{3}{10}$ (small) $- \frac{2}{10}$ (small math (overlap)) $= \boxed{\frac{6}{10}} = \boxed{\frac{3}{5}}$

38) "And" $\frac{4}{10} = \boxed{\frac{2}{5}}$

39) How many 7-letter permutations can be made from the letters in the word "GOGGLES"?

$$\frac{7!}{3!} = \frac{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1} = 42 \cdot 20 = \boxed{840}$$

40) How many 6-letter permutations can be made from the letters in the word "TEETER"?

$$\frac{6!}{2!3!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1 \quad 3 \cdot 2 \cdot 1} = \boxed{60}$$

41) A box contains 6 red pencils and 4 yellow pencils. Two students wish to borrow a pencil from this box. If the students are selecting a pencil at random, what is the probability that the first student will select a red pencil and the second student will select a yellow pencil?

42) Barry has taken 4 quizzes in his social science class. He has received the following scores: 9, 5, 8, 1
If the mean of these scores is approximately 6, what is the population standard deviation for these scores? (Round the answer to the nearest tenth.)
A) 9.8 B) 6.5 C) 3.1 D) 1.7

σ

$6 = \bar{x}: \quad \frac{9+5+8+1}{4} = \frac{23}{4} = 5.\ldots \approx 6$

x	9	5	8	1
$x-\bar{x}$:	3	-1	2	-5
$(x-\bar{x})^2$:	9	1	4	25

$\sigma^2 = \frac{9+1+4+25}{4} = \frac{39}{4} = 9.75$

$\sigma = \sqrt{9.75} \approx 3.1 \rightarrow$ C) 3.1

9.75
4|39.0
-36
3.0
-28
2

43) Given the scores of 4, 7, and 1, find the population variance for this set of data. (Round the answer to the nearest tenth.)
A) 2.0 B) 2.4 C) 3.0 D) 6.0

σ^2

$\bar{x}: \quad \frac{4+7+1}{3} = \frac{12}{3} = 4$

x	4	7	1
$x-\bar{x}$	0	3	-3
$(x-\bar{x})^2$	0	9	9

$\sigma^2 = \frac{0+9+9}{3} = \frac{18}{3} = 6 \rightarrow$ D) 6.0