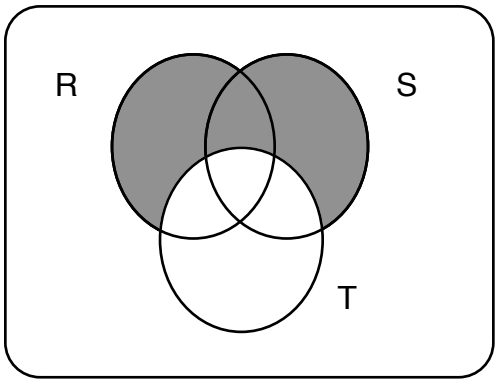
MATH 104 - EXAM I

1. Let $U = \{a, b, c, d, e, f, g\}$
$A = \{a, b, d\}$
$B = \{b, e\}$
$C = \{e, f\}$.
Which of the following sets is equal to $(A \cup B) \cap C'$?
(a) $\{b\}$ (b) $\{a, b, d\}$ (c) $\{a, b, d, e\}$ (d) $\{a, b, d, e, f\}$ (e) $\{a, b, e, f\}$

2. In a group of 30 people, 15 run, 13 swim, 13 cycle, 5 run and swim, 8 cycle and swim, 9 run and cycle, and 5 do all three activities. How many of the 30 people neither run nor cycle?
(a) 12 (b) 10 (c) 9 (d) 11 (e) 8

3.



Which of the following sets is represented by the shaded region in the Venn diagram above?
(a) $(R \cup S) \cap T'$ (b) $R \cap S \cap T'$ (c) $(R \cap S) \cup T'$ (d) $R \cup S \cup T'$
(e) $(R' \cap S') \cup T$

4. A survey of 44 Notre Dame Faculty reveals that 25 subscribe to the New York Times, 20 subscribe to the South Bend Tribune, and 10 subscribe to neither. How many of the 44 get both the New York Times and South Bend Tribune?
(a) 13 (b) 6 (c) 11 (d) 7 (e) 8

5. How many possible sequences of heads and tails are there if a coin is to be tossed 8 times?

(a) 2×8 (b) 8^2 (c) 2^8 (d) $2 + 8$ (e) $8^2/2!$

6. How many possible ways are there of lining up 8 children for a photograph if 2 of the children (Sid and Nancy) refuse to stand next to one another?

(a) $8! - 2 \times 7!$ (b) $8!$ (c) $2 \times 7!$ (d) $C(8,6)$ (e) $P(8,6)$

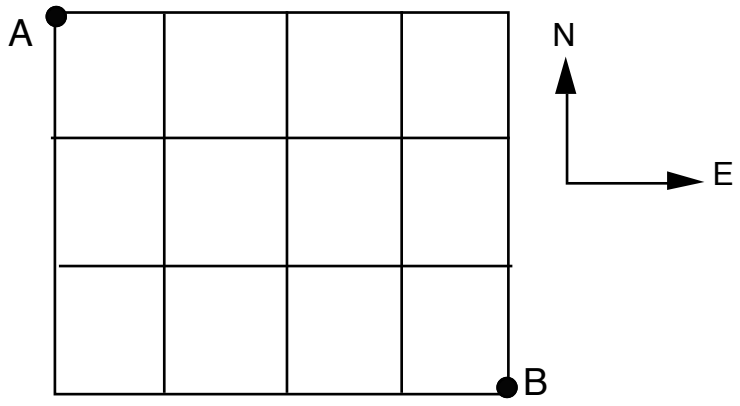
7. An urn contains 3 green balls and 4 blue balls. A sample of four balls is selected at random from the urn (without replacement). How many such samples of 4 balls contain 2 blue balls and 2 green balls?

(a) 48 (b) 72 (c) 12 (d) 9 (e) 18

8. A coin is tossed ten times. How many of the possible sequences of heads and tails for these 10 tosses contain either one or two heads?

(a) 45 (b) 55 (c) 40 (d) 50 (e) 35

9.



The above is a map of the roads in a small country town. How many ways are there of traveling from A to B along these roads, always moving East or South?

(a) 35 (b) 210 (c) 128 (d) 21 (e) 15

10. There are 28 players in the first round of a singles tennis tournament. In how many ways can they be split into pairs for the fourteen first-round matches.

(a) $\frac{28!}{14!^2\,2!}$ (b) $\frac{28!}{2!^{14}}$ (c) $\frac{28!}{14!^2}$ (d) $\frac{28!}{2!^{14}\,14!}$ (e) $\frac{14!}{2!^{14}}$

11. Nine children in preschool are to be divided into three groups of three children; one group will play with blocks, another with paints, and the third group will sleep. In how many ways can this be done?

(a) $\frac{9!}{3!^3\,3!}$ (b) $\frac{9!}{3!^3}$ (c) C(9,3) (d) P(9,3) (e) 9!

12. How many different five-letter words (including nonsense words) can be formed if no letter may be used more than once?

(a) 5^{26} (b) C(26,5) (c) 26^5 (d) P(26,5) (e) 5!

13. How many different poker hands (5 cards from a standard deck) consist of two kings and 3 cards of another denomination?

(a) C(4,2) x 13 x C(4,3) (b) C(4,2) x 12 x C(4,3) (c) P(4,2) x 12 x P(4,3)

(d) P(4,2) x 13 x P(4,3) (e) C(4,2) x 12

14. What is the coefficient of p^4q^4 in the binomial expansion of $(p + q)^8$?

(a) 21 (b) 210 (c) 56 (d) 30 (e) 70

15. The odds of the horse "Crackerjack" winning the Melbourne cup horse race are 2:5. What is the probability "Crackerjack" will win?

(a) 2/7 (b) 2/5 (c) 2/10 (d) 2/25 (e) 1/7

16. Two dice, one red and one green, are rolled. What is the probability that the sum of the two numbers on their top faces is 10 or higher?

(a) 1/36 (b) 1/6 (c) 1/12 (d) 1/18 (e) 1/9

17. E and F are events with Pr(E) = 0.6, Pr(F) = 0.5 and Pr(E ∪ F) = 1. What is Pr(E ∩ F)?

(a) 0.3 (b) 0 (c) 0.2 (d) 0.1 (e) 0.4

18. An experiment with outcomes a, b, c, d is described by the probability table

Outcome	Probability
a	0.2
b	0.1
c	0.15
d	0.55

Consider the events E = {a, b, c} and F = {b, c, d}. What is Pr(E ∩ F)?

(a) 0.45 (b) 1 (c) 0.25 (d) 0.8 (e) 0

19. Two dice are rolled, and the numbers on their top faces are recorded. Consider the following events

E : both numbers are odd

F : the sum of the two numbers is odd

G : at least one of the numbers is a 5

Which of the following statements about these events is true?

(a) F and G are mutually exclusive

(b) E and G are mutually exclusive

(c) E and F are mutually exclusive

(d) each pair of these events is mutually exclusive

(e) no two of these events are mutually exclusive

20. A coin is tossed 10 times and the number of heads is recorded. The sample space for this experiment is {0, 1, 2, 3, ···, 10}. Which of the following subsets of the sample space corresponds to the event "the number of tails is at least two greater than the number of heads"?

(a) {0, 1, 2, 3, 4, 5, 6}
(b) {4, 5, 6, 7, 8, 9, 10}
(c) {6, 7, 8, 9, 10}
(d) {4, 3, 2, 1, 0}
(e) {5, 6, 7, 8, 9, 10}