MATH 140 TEST 1$_{M79}$ SPRING 2021   NAME:_____

CLASS SECTION:_____

10 AM is section 813; 1 PM is section 811; 3 PM is section 812

No help from any person other than yourself and from any notes other than your own. However, you may use other books from the library. You may discuss this paper only with the instructor before handing it in to be graded. If you do not understand these directions see the grading policies under cheating. *Use of outside aides other than the notes, your own notes, the Z-table hand-out, and your brain is forbidden! No calculators are needed but if you use one don't use one beyond TI-30.*

"I understand the definition of cheating and I received no help from another person nor did I confer with any other person:"

Signature:_____

Due: 4:00 P.M. Monday, 15 March 2021 – hand in the test at LY 230.   200 point test.
If it is handed in a time, x, such that 4:10 < x ≤ 4:15 , 1/4 of the total points possible will be deducted from the student's grade, if it is handed in a time, x, such that 4:15 < x ≤ 4:20, 1/2 of the total points possible will be deducted from the student's grade, if it is handed in a time, x, such that 4:20 < x ≤ 4:25, 3/4 of the total points possible will be deducted from the student's grade, if it is handed in a time, x, such that x > 4:25 the student will earn a zero. If it is handed in early slide it under the door of the seminar room (230 Lytle Hall) outside my office (230A Lytle Hall). If one is too far away from campus see worksheet 8 instructions on returning it via e-mail (due 4 PM also).

Use handwriting and pencil only. *(-10 for each direction not followed).* **Do your work only on this paper (turn in NO other paper other than this test (**10 point deduction automatically if this is not done**)). The back of each page serves as** 'scratch work' areas.

All the necessary & sufficient steps for a solution to a problem must be shown on this test in part II and part III - - if there is no work shown - - no credit will be earned - justification must be given to claim mathematical truth! **Part I need not have accompanying work.**

Part I: No work need be shown in part I.   Multiple choice: choose the correct answer(s) and place the correspond **CAPITAL letter(s)** in the answer blank. No credit for circled results, etc. Do not write the actual answer that corresponds to the capital letter –that is just wasting space and time. **More than one option may be correct in some problems.**
DO **15** OF THE **21** MULTIPLE CHOICE PROBLEMS**. WRITE OMIT IN THE BLANK OF THE six (6) PROBLEMS NOT DONE** (if this is not done properly 16 - 21 will be omitted automatically I am not searching for the "best.").   No partial credit, part I only. (8 pts each ⇒ 120 points)

1. Consider the following diagramme   Answer 1:_____

Suppose a person throws a dart and hits one of the boxes. Assume the game is fair. The probability a shaded box is hit is:

A. $\dfrac{2}{6}$ B. $\dfrac{1}{2}$ C. $\dfrac{3}{6}$ D. $\dfrac{1}{3}$ E. $\dfrac{2}{3}$ F. $\dfrac{4}{6}$ F. None of these

2. Suppose an urn contains a number of red balls, white balls, and blue balls.   Answer 2:_____
Suppose we draw 3 balls from the urn and count the number of red balls drawn (r). What
must the probability of choosing zero red balls (value that goes in the box} according to the axioms of probability?

R = r	Pr (R = r)
0	□
1	0.1
2	0.11
3	0.15

A. 0.73   B. 0   C. 0.36   D. 0.64   E. 0.27   F. None of these

For problems 3 – 7 only Let $U = \mathbb{R}$ Let S be a well-defined sample space $[0, 10]$.

Let A = [1, 4), B = (2, 5], C = (1, 6), D = [3, 7] , and E = [6, 8)

3. It is the case that the events A and E are: Answer 3:_____

A. mutually exclusive   B. ratio   C. exhaustive   D. independent   E. interval   F. None of these

4. Pr $(A \cap B) =$ Answer 4:_____

A. 0   B. 0.1   C. 0.2   D. 0.3   E. 0.4   F. 0.5   G. 0.6   H. 0.7   J. –0.2   K. None of these

5. Pr $(A \cup C) =$ Answer 5:_____

A. 0   B. 0.1   C. 0.2   D. 0.3   E. 0.4   F. 0.5   G. 0.6   H. 0.7   J. –0.2   K. None of these

6. Pr $(B \cap D^C) =$ Answer 6:_____

A. 0   B. 0.1   C. 0.2   D. 0.3   E. 0.4   F. 0.5   G. 0.6   H. 0.7   J. –0.2   K. None of these

7. Pr $(B - C) =$ Answer 7:_____

A. 0   B. 0.1   C. 0.2   D. 0.3   E. 0.4   F. 0.5   G. 0.6   H. 0.7   J. –0.2   K. None of these

8.   We have a fair standard bridge deck of 52 cards   Answer 8:_____
We draw a card.   The probability that the card drawn is a seven and a spade is

A. 0   B. $\dfrac{1}{52}$ C. $\dfrac{4}{52}$ D. $\dfrac{8}{52}$ E. $\dfrac{13}{52}$ F. $\dfrac{16}{52}$ G. $\dfrac{17}{52}$ H. 1   K. None of these

9.   We have a fair standard bridge deck of 52 cards   Answer 9:_____
We draw a card.   The probability that the card drawn is a jack or a diamond is

A. 0   B. $\dfrac{1}{52}$ C. $\dfrac{4}{52}$ D. $\dfrac{8}{52}$ E. $\dfrac{13}{52}$ F. $\dfrac{16}{52}$ G. $\dfrac{17}{52}$ H. 1   K. None of these

10.   We have a fair standard bridge deck of 52 cards   Answer 10:_____
We draw a card.   The probability that the card drawn is a ten given it is a club is

A. 0   B. $\dfrac{1}{52}$ C. $\dfrac{4}{52}$ D. $\dfrac{8}{52}$ E. $\dfrac{13}{52}$ F. $\dfrac{16}{52}$ G. $\dfrac{17}{52}$ H. 1   K. None of these

11.   We have a fair standard bridge deck of 52 cards   Answer 11:_____
We draw a card.   The probability that the card drawn is a ten and a king is

A. 0   B. $\dfrac{1}{52}$ C. $\dfrac{4}{52}$ D. $\dfrac{8}{52}$ E. $\dfrac{13}{52}$ F. $\dfrac{16}{52}$ G. $\dfrac{17}{52}$ H. 1   K. None of these

12.   We have a fair standard bridge deck of 52 cards   Answer 12:_____
We draw a card.   The probability that the card drawn is a ten or a king is

A. 0   B. $\dfrac{1}{52}$ C. $\dfrac{4}{52}$ D. $\dfrac{8}{52}$ E. $\dfrac{13}{52}$ F. $\dfrac{16}{52}$ G. $\dfrac{17}{52}$ H. 1   K. None of these

13. Suppose an urn contains 1 red balls, 4 white balls, and 5 blue balls.   Answer 13:_____
A ball is drawn then another.
The probability that of the balls the second is blue given the first is white is:

A. $\dfrac{1}{5}$ B. $\dfrac{1}{2}$ C. $\dfrac{2}{9}$ D. $\dfrac{1}{3}$ E. $\dfrac{5}{9}$ F. $\dfrac{1}{10}$ G. $\dfrac{1}{9}$ H. None of these

14. Suppose an urn contains 1 red balls, 4 white balls, and 5 blue balls.   Answer 14:_____
A ball is drawn then another.
The probability that of the balls the second is red given the first is red is:

A. $\dfrac{1}{5}$ B. $\dfrac{1}{2}$ C. $\dfrac{2}{9}$ D. $\dfrac{1}{3}$ E. $\dfrac{5}{9}$ F. $\dfrac{1}{10}$ G. $\dfrac{1}{9}$ H. None of these

15. Let S be a well-defined sample space with $J \wedge K$ events.   Answer 15:_____
Let $Pr\,(J) = 0.20,\quad Pr(K) = 0.13,\quad$ and $Pr(J \cap K) = 0.026$ Thus, J and K are:

A. mutually exclusive   B. ratio   C. exhaustive   D. independent   E. interval   F. None of these

16. Suppose an urn contains 1 red balls, 4 white balls, and 5 blue balls.   Answer 16:_____
Pick two balls and note their colour. The number of ways one can choose two blue balls is:

A. $\dfrac{2}{5}$ B. 10   C 5   D. $\begin{pmatrix}5\\2\end{pmatrix}$ E. $\begin{pmatrix}10\\5\end{pmatrix}$ F. None of these

For problems 17 - 21 only. Let Z be a normal random variable with $\mu = 0$ and $\sigma = 1$; If approximating, all answers should be an approximation to 3 decimal place accuracy.

17. $Pr(Z = 0.35) \approx$ Answer 17:_____

A. 1   B. 0.9998   C. 0.6500   D. 0.6368   E. 0.3632   F. 0.3500 G. 0.1368   H. 0   J. None of these

18. $Pr(Z > 0.35) \approx$ Answer 18:_____

A. 1   B. 0.9998   C. 0.6500   D. 0.6368   E. 0.3632   F. 0.3500 G. 0.1368   H. 0   J. None of these

19. $Pr(0 \le Z < 0.35) \approx$ Answer 19:_____

A. 1   B. 0.9998   C. 0.6500   D. 0.6368   E. 0.3632   F. 0.3500 G. 0.1368   H. 0   J. None of these

20. $Pr(Z > -1.21) \approx$ Answer 20:_____
A. 0.9821   B. 0.8869 C. 0.8686 D. 0.4821   F. 0.3869 G. 0.1131   H. 0.0179   J. None of these

21. $Pr(Z \le -1.21) \approx$ Answer 21:_____
A. 0.9821   B. 0.8869 C. 0.8686 D. 0.4821   F. 0.3869 G. 0.1131   H. 0.0179   J. None of these

Part II: Show all work - no credit otherwise. All the necessary & sufficient steps for a solution to a problem must be shown on this test - If there is no work shown - no credit will be earned - justification must be given to claim mathematical truth! If an answer does not exist please write DNE in the answer blank and explain why it does not exist.

DO 2 OF THE 3 PROBLEMS in this section. WRITE OMIT ACROSS THE **PAGE** OF THE <u>PROBLEM </u>NOT DONE **(if this is not done properly 23 will be omitted automatically I am not searching for the "best.").   50 points**

20.   You have a pair of standard fair dice. One is coloured blue the other red. You roll them. You note the two faces turned up and you take the difference of the red die *from* the blue die (blue minus red of the numbers shown).
A. Draw a standard chart as discussed in class to illustrate this experiment. (10 points)

B. Find the probability the event $\{-3\}$ (the result is negative 3). (5 pts)

Answer B:_____

C. Find the probability the event $\{1\}$ (the result is positive 1). (5 pts)

Answer C:_____

D. Find the probability the event $\{x \mid x \geq 0\}$ (the result is zero or greater). (5 pts)

Answer D:_____

21. Let $X \sim Bin(x, n = 5, p = \frac{3}{10})$

A. Find $Pr(X = 2)$ (7 pts)

Answer A:_____

B. $Pr(2 \leq X < 5)$ (9 pts)

Answer B:_____

C. $Pr(X > 1)$ (9 pts)

Answer C:_____

22. A fair die is tossed 5 times. If a one or a six is showing (e.g.: is the side facing up), then we will call that toss a success.

A. Find the probability of obtaining more successes than failures. (13 pts)

Answer 22A:_____

B. Is this experiment binomial? If yes – explain. If no – explain. (in other words: why do you opine what you opine) (Limit your response to 3 sentences or less, please) (12 points)

Part III: Show all work - no credit otherwise. All the necessary & sufficient steps for a solution to a problem must be shown on this test - If there is no work shown - no credit will be earned - justification must be given to claim mathematical truth! If an answer does not exist please write DNE in the answer blank and explain why it does not exist.

THIS PROBLEM MUST BE DONE

23. Let us consider the SAT as defined as it is normally distributed with a $\mu = 1000$ and a $\sigma = 200$.   15 points each

A. Suppose person A has an SAT of 800. Approximately what is the probability that a randomly chosen person has a score equal to or greater than person A (percentage of the population have SATs greater than person A, same concept but do not report percentages, please)?

Answer 23A:_____

B. Suppose person B has an SAT of 1255. Approximately what is the probability that a randomly chosen person has a score less than or equal to the score of person B but greater than the mean (percentage of the population have SATs less than or equal to person B but larger than the mean; again, same concept but do not report percentages, please)?

Answer 23B:_____

End, Math 140 Test 1$_M$ Spring 2021.