Guessing on a Multiple-Choice Test

Suppose this week's history test consists of twenty multiple-choice questions. You did not study, so you will guess the correct response to each question.

1. If there are five responses from which to choose, only one of which is correct, what is the likelihood that you will answer any one question correctly? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

2. For this investigation we will use a table of random digits to simulate taking the history test. If there are ten digits (0, 1, 2, …, 9), then how many of these digits should represent a correct response? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

3. a. Which digits would you like to label as a correct response?

   b. Which digits would you like to label as an incorrect response?

The string of twenty digits below was taken from a table of random digits. Let each digit correspond to a question on the history test.

85392 41532 86687 16444

4. According to the digits above and the labels assigned in #3, how many questions were answered correctly?

5. Use the table of random digits provided to conduct a total of 20 trials for this simulation exercise. Record the total number of correct responses for each trial in the table below.

Trial #	# Correct	Trial #	# Correct	Trial #	# Correct	Trial #	# Correct
1		6		11		16	
2		7		12		17	
3		8		13		18	
4		9		14		19	
5		10		15		20	

6. a. You need at least 18 correct responses to receive an A on the test. Based on the results of your simulation, what is the probability of earning an A?

b. You need 16 or 17 correct responses to receive a B on the test. Based on the results of your simulation, what is the probability of earning a B?

c. You need 14 or 15 correct responses to receive a C on the test. Based on the results of your simulation, what is the probability of earning a C?

d. You need at least 12 correct responses to pass the test. Based on the results of your simulation, what is the probability of passing?

e. Based on the results of your simulation, what is the probability of failing the test?

f. What is the sum of your result from parts d and e? Will this sum always be the same? Use mathematics to justify your answers.

Table of Random Digits

Line									
1	89470	34231	77439	77008	03569	51225	26932	20265	76484
2	03404	42582	46841	77983	69237	45143	43982	33246	21696
3	50883	44636	05135	50051	13690	41800	58902	22068	49406
4	14805	51031	13002	98577	48318	59532	81291	30759	14972
5	50546	42082	21646	52428	74961	58761	11123	32750	07054
6	42966	25507	26774	13076	16409	93270	86194	77944	24690
7	14004	81839	28420	83942	67410	13910	80304	36011	12854
8	61425	10877	33037	24604	98278	77528	60105	01216	42502
9	31121	28143	72110	25381	54152	47658	94164	86893	14053
10	39391	28893	14835	77356	75610	96239	71092	81662	96176
11	13588	22830	48029	91989	56454	19372	27986	00404	30099
12	73615	78268	38308	20987	35019	70611	02795	04544	14743
13	07343	40442	85063	75853	69891	88510	58943	37011	15207
14	06762	58658	50386	08921	17347	18326	98143	04149	63934
15	16441	40374	47092	02066	54596	09259	77467	81449	94105
16	05688	54317	82513	03057	96689	94479	97207	17273	18225
17	80606	99756	55613	19083	77296	12819	85948	28337	20757
18	64121	61750	68206	36219	98527	23798	51801	52193	14432
19	53624	14443	39067	199777	77557	66765	76195	02985	74886
20	34356	66107	21627	12656	21678	94370	75697	62006	60762
21	60909	60720	30485	60729	46781	43236	05752	50464	27880
22	57512	31121	79024	45654	24580	16824	80279	66706	85793
23	82180	06973	07739	28815	13380	57084	35223	52327	59708
24	86766	72100	03589	76634	16786	14589	11059	29493	24922
25	39202	80559	22692	57183	73478	76522	90021	04754	98055

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Answer Key

1. $\frac{1}{5} = 0.20$
2. Two digits should represent a correct response. (2/10) = (1/5)
3. a. Answers will vary. One possible way to label a correct response using 0 or 1.
   b. All other digits should represent an incorrect response. In this case: 2, 3, 4, …, 9.
4. Answers will vary. Using the above labels, only two responses are correct.
5. Answers will vary. Beginning on line 1 of the Table of Random Digits, the results follow:

Trial #	# Correct	Trial #	# Correct	Trial #	# Correct	Trial #	# Correct
1	4	6	10	11	6	16	7
2	3	7	5	12	3	17	4
3	3	8	7	13	6	18	7
4	1	9	4	14	5	19	8
5	1	10	3	15	6	20	2

6. a. Answers will vary. For the above results, 0.00.
   b. Answers will vary. For the above results, 0.00.
   c. Answers will vary. For the above results, 0.00.
   d. Answers will vary. For the above results, 0.00.
   e. Answers will vary. For the above results, 1.00.
   f. They add up to 1.00. The sum will always be 1 because passing and failing the test include all possible results of taking the test. Therefore, their probability must be 1.