

Random Digit Simulations

Model compound events with random digits, then count what happens.

GRADE 7 • 7.SP.C.8c

CCSS.Math.Content.7.SP.C.8c "Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood..."

NAME _____

DATE _____

HOW A SIMULATION WORKS

A simulation uses random digits to act out an event many times. First assign digits to match the probability: if an event happens 40% of the time, let 4 of the 10 digits (0, 1, 2, 3) stand for it. Then read the digits in groups, one group per trial of the compound event, count the groups that match what you are looking for, and divide by the number of groups.

WORKED EXAMPLE

40% of donors have type A blood. Let the digits 0, 1, 2, 3 mean type A. Each group of 4 digits is 4 donors. Groups: 5731 8290 4467 1520 9884. Estimate the probability that at least one of 4 donors has type A.

1. Mark each group that contains a 0, 1, 2, or 3: 5731 yes, 8290 yes, 4467 no, 1520 yes, 9884 no.
2. Count the matching groups: 3 of 5.
3. Estimated probability = $3/5 = 60\%$.

Answer: 3/5, or about 60%

PRACTICE 4 problems

- 1** A spinner lands on red 30% of the time. Which digits could stand for red in a simulation? Explain why that choice matches 30%.

ANSWER _____

- 2** A player makes 50% of free throws. Let the digits 0 to 4 mean a made shot. Each pair of digits is 2 shots. Pairs: 27 83 41 09 66 55. Estimate the probability that both shots are made.

ANSWER _____

- 3** A quiz has 3 true-or-false questions. A guess is right 50% of the time. Let even digits (0, 2, 4, 6, 8) mean a right guess. Groups of 3 digits: 384 157 026 993 468. Estimate the probability of guessing all 3 right.

ANSWER _____

- 4** 20% of card packs contain a rare card. Let the digits 0 and 1 mean a rare card. Each group of 5 digits is 5 packs. Groups: 24853 10967 77032 58831 66240 39975. Estimate the probability of at least one rare card in 5 packs.

ANSWER _____

APPLY IT Show your work

1

40% of donors have type A blood. Let the digits 0 to 3 mean type A. It takes at least 4 donors to find type A only when none of the first 3 donors has it, so each group of 3 digits is the first 3 donors. Groups: 582 731 964 409 877 256 690 148. Estimate the probability that it takes at least 4 donors to find one with type A.

WORK SPACE

ANSWER _____

2

A weather app says each of the next 3 days has a 70% chance of rain. Let the digits 0 to 6 mean rain. Each group of 3 digits is 3 days. Groups: 715 038 942 660 283 597 401 876 129 350. Estimate the probability that it rains on all 3 days.

WORK SPACE

ANSWER _____

CHALLENGE One step up

In a class raffle, 25% of tickets win a prize. Explain why single digits cannot model a 25% chance, and design a way to model it with random digits. Then describe how you would use your model to estimate the probability that at least 2 of 4 tickets win.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A spinner lands on red 30% of the time. Which digits could stand for red in a simulation? Explain why that choice matches 30%.	Any 3 of the 10 digits, for example 0, 1, 2, because 3 out of 10 digits is 30%.
2	A player makes 50% of free throws. Let the digits 0 to 4 mean a made shot. Each pair of digits is 2 shots. Pairs: 27 83 41 09 66 55. Estimate the probability that both shots are made.	1/6 (only 41 has two digits from 0 to 4)
3	A quiz has 3 true-or-false questions. A guess is right 50% of the time. Let even digits (0, 2, 4, 6, 8) mean a right guess. Groups of 3 digits: 384 157 026 993 468. Estimate the probability of guessing all 3 right.	2/5 (026 and 468 are all even)
4	20% of card packs contain a rare card. Let the digits 0 and 1 mean a rare card. Each group of 5 digits is 5 packs. Groups: 24853 10967 77032 58831 66240 39975. Estimate the probability of at least one rare card in 5 packs.	4/6 = 2/3 (all groups except 24853 and 39975 contain a 0 or 1)

PART 2 • APPLY IT

- 2/8 = 1/4** A group counts only if it has no digit from 0 to 3. Only 964 and 877 qualify, so 2 of 8 groups, which is 1/4.
- 3/10** A group counts only if all 3 digits are 0 to 6. Only 660, 401, and 350 qualify, so 3 of 10 groups, which is 3/10.

CHALLENGE

Single digits give chances in tenths only, and 25% is not a whole number of tenths. Use pairs of digits from 00 to 99 and let 00 to 24 mean a winning ticket, since that is 25 of the 100 pairs. Read the digits in groups of 4 pairs (8 digits), one group per set of 4 tickets, count the groups with at least 2 winning pairs, and divide by the number of groups.

Accept equivalent fractions, decimals, or percents. For Problem 1 and the challenge, accept any digit assignment that gives the correct number of digits or pairs to the event.