

AFM Objective 1.03

Probability

Show all work on a separate sheet of paper! Be neat and organized! Box in your final answers to each question.

Problem 1: The student population at Roosevelt High is 1046. The entire student population was surveyed, and then categorized according to class and number of hours worked per week at a paying job.

	0 hr.	Work < 10 hr.	Work 10 to 20	Work > 20 hr.
Freshmen	240	13	2	1
Sophomores	223	52	4	0
Juniors	103	25	88	47
Seniors	58	35	110	45

- What is the probability that a randomly selected student from this school is a senior who does not have a job?
- What is the probability that a randomly selected student is a sophomore who works between 10 and 20 hours per week?
- What is the probability that a randomly selected student is a freshman?
- What is the probability that a randomly selected student does not have a job?
- What is the probability that a student is a freshman OR works less than 10 hours per week?
- Which events are mutually exclusive?
 - Being a freshman and working less than 10 hours per week.
 - Being a senior and not having a job.
 - Being a sophomore and working more than 20 hours per week.
- What is the probability that a randomly selected student works more than 20 hours per week?
- What is the probability that a randomly chosen student works more than 20 hours per week, given that s/he is a freshman?
- What is the probability that a randomly chosen student works more than 20 hours per week, given that s/he is a senior?

Problem 2: A detective figures that he has a one in nine chance of recovering stolen property. His out-of-pocket expenses for the investigation are \$6000. He is paid his fee only if he recovers the stolen property.

- Write a statement that explains what he should charge clients in order to breakeven. (use expected value rules)

Problem 3: A fair coin is tossed five times. On each toss, the probability of a head is $\frac{1}{2}$, and the five tosses are all independent events.

- What is the probability that exactly two of the five coin tosses produced a head?
- What is the probability that the five coin tosses produce at least one head?
- At most one head?
- What is the expected value of the number of heads?

Problem 4: An unfair coin is weighted so that the probability of a head is $\frac{1}{3}$ and the probability of a tail is $\frac{2}{3}$. The coin is tossed seven times, and the outcome on each toss is independent of that on all of the other tosses.

- What is the probability that the seven coin tosses produce at least two heads?
- Exactly two heads?
- Which is more likely, two heads out of seven or four heads out of seven? Justify your answer.

Problem 5: The table below shows the probability distribution of scores on the AP Calculus AB exam given during May of 2013.

s	1	2	3	4	5
$P(s)$.294	.112	.173	.181	.239

Data Source: Student Score Distributions – AP Exams May 2013

<http://media.collegeboard.com/digitalServices/pdf/research/2013/STUDENT-SCORE-DISTRIBUTIONS-2013.pdf>

- What is the probability that of a random student will score a 3 or higher?
- At some universities, you must score a 4 or higher to be awarded credit. What is the probability of a random student scoring 4 or higher?
- 282,814 students took the AP Calculus AB Exam in May of 2013. How many students were not eligible to receive credit at a school that required a score of 3 or higher?
- How many students could receive credit at school that required a 4 or higher?
- What was the mean score for this exam?

Problem 6: Create a representation of the sample space that will show all of the possible outcomes of two randomly selected numbers between 0 and 8 in which repetition is allowed.

- Create a probability distribution table for the sum of the two numbers. *(see table in # 5)*
- What is the probability that their sum is less than or equal to five? *for example*
- What is the probability that their sum is greater than or equal to nine?
- What is the probability that their sum is 6 or 11?
- What is the probability that their sum is 3 or 7?

Problem 7: Each day two out of three teams are randomly selected to participate in a game.

- What is the probability that team A is selected on at least two of the next three days?

Problem 8: The student council conducted a poll to determine its activities for the year. 328 students responded to the poll.

Part of the survey asked about what dances the student council should organize: Homecoming Dance or a Winter Formal.

Dance	Votes
Homecoming	158
Winter Formal	127
Voted for Both	85

- a. How many students did not vote for either dance?

Another part of the survey asked about the priorities of the student council. The students were given two options: Changing the dress code or getting more options for lunch in the cafeteria.

Priority	Votes
Changing Dress Code	257
More options for Lunch	198
Did not vote for a priority	15

- b. How many students voted for both priorities?