

VIII. (15 points)

A fisherman catches, on average, 3 fish per hour. Assume the number of fish caught in any time period follows Poisson distribution.

1. What is the probability that the fisherman catches exactly 4 fish during a randomly selected one-hour session?
2. If the fisherman goes fishing for 45 minutes, what is the probability that he catches at least 2 fish during this period?
3. Using a suitable Normal approximation, find the probability that the fisherman catches between 20 and 28 fish (inclusive) during an 8-hour fishing day.

Areas Under the Normal Curve

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9700	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9990	0.9991	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9993
3.2	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	0.9994	0.9994	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

أسئلة الامتحانات الفصلية للعام الجامعي 2025-2026

القسم: Data Sciences	اسم المقرر: احصائيات 1
الفصل: First	اسم الأستاذ: Kassem Rammal
الدورة: First	مدة الامتحان: 120 minutes
السنة: First	لغة الامتحان: English

I. (5 points)

Let X be a discrete random variable with the following probability distribution:

x	1	4	β
$P(X = x)$	0.1	0.5	0.4

Determine the value of β so that the expected value $E(X) = 4.1$.

II. (28 points)

Air quality monitoring in a metropolitan area has been a concern for many years. Consider the following events:

- A : The air is polluted.
- B : A sensor detects pollution.
- C : Outdoor activities are permitted.

Assume:

$$\begin{aligned}P(A) &= 0.3, \\P(B|A) &= 0.75, \\P(B|\bar{A}) &= 0.1, \\P(C|A \cap B) &= 0.25, \\P(C|\bar{A} \cap B) &= 0.15, \\P(C|A \cap \bar{B}) &= 0.8, \\P(C|\bar{A} \cap \bar{B}) &= 0.9.\end{aligned}$$

1. Find $P(A \cap B | A \cup B)$.
2. Find $P(A \cap B \cap C)$, $P(A \cap \bar{B} \cap C)$, $P(\bar{A} \cap \bar{B} \cap C)$.
3. Deduce $P(\bar{B} \cap C)$.
4. Find $P(C)$.
5. Find the probability that the air is polluted, given that outdoor activities are permitted and the sensor did not detect pollution.

III. (10 points)

The average salary for first-year teachers is \$27,989. Assume the distribution is approximately normal with standard deviation \$3,250.

1. What is the probability that a randomly selected first-year teacher makes between \$20,000 and \$30,000 each year?
2. What is the probability that a randomly selected first-year teacher has a salary less than \$20,000?

IV. (10 points)

The national average SAT score is 1019. Assume SAT scores follow a normal distribution with standard deviation 90.

1. What is the probability that a randomly selected score exceeds 1200?

2. What is the 90th percentile score?

V. (10 points)

In the last 100 years, there have been 93 earthquakes measuring 6 or more on the Richter scale.

What is the probability of having 3 earthquakes in the same year that all measure 6 or more?

VI. (16 points)

Assume that 13% of people are left-handed. If we select 5 people at random, find the probability of each outcome below:

1. The first lefty is the fifth person chosen
2. There are exactly 3 lefties in the group
3. There are some lefties among the 5 people
4. There are no more than 3 lefties in the group

VII. (6 points)

The joint probability distribution of two random variables (X, Y) is given by:

	$X = 0$	$X = 2$
$Y = 0$	0.1	0.3
$Y = 2$	0.3	0.1
$Y = 4$	0.1	0.1

Compute the conditional probability: $\mathbb{P}(X = 2 \mid Y = 2)$.