ENEE2307
Online Quiz Ch2

تحذير ⚠️: قد تتكرّر بعض الأسئلة.

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x) = \begin{cases} \frac{2}{64}\,x & 0 \le x \le 8; \\ 0, & \text{otherwise.} \end{cases}$$

Find the median of the distribution of X. ☐

[The answer should be a number rounded to five decimal places, don't use symbols such as %]

$f(x) = \frac{2}{64} x \, dx \qquad 0 \leq x \leq 8$

$= 0$

m is median

$m = \int_0^M f(x)\, dx = \frac{1}{2}$

$M = \frac{2}{64} \int_0^M x \, dx = \frac{1}{2} \Rightarrow \frac{2}{64} \left[\frac{x^2}{2} \right]_0^M = \frac{1}{2}$

$\Rightarrow \frac{M^2}{64} - 0 = \frac{1}{2}$

$\Rightarrow \frac{M^2}{64} = \frac{1}{2} =$

$\Rightarrow M^2 = 64/2 = 32$

$\Rightarrow M = \sqrt{32}$

$M = 5.65685$

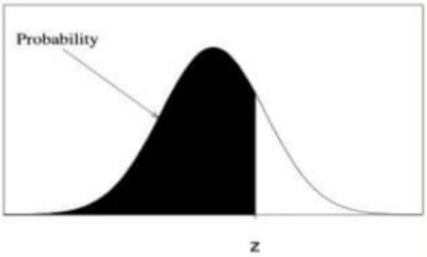
Median is $\boxed{5.65685}$

Hence, the median of the distribution of x $\boxed{5.65685}$

A multiple-choice exam contains 56 questions, each with 4 options (one is the correct answer). Assume that a student, who did not study well on the exam, decided to just guess on each answer. To pass the exam, a student must answer at least 20 questions correctly.

Probabilities for the standard normal distribution

Table entry for z is the probability lying to the left of z



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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	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	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

Use the normal approximation to find the probability that a student will pass the exam?

[The answer should be a number rounded to five decimal places, don't use symbols such as %]

$n = 56$

$P(\text{correct guess}) = \frac{1}{4} = 0.25$

$p = 0.25$

$q = 1 - p = 0.75$

$P(x \geq 20) = ?$

$= P(x > 19.5)$ ($\because$ continuity correction)

$\mu = n \cdot p$

$= 56 \times 0.25$

$= 14$

$\sigma = \sqrt{npq}$

$= \sqrt{56 \times 0.25 \times 0.75}$

$\sigma = 3.2404$

$P(x > 19.5) = P\left(z > \frac{19.5 - 14}{3.2404}\right)$ ($\because z = \frac{x - \mu}{\sigma}$)

$= P(z > 1.6973)$

$= \boxed{0.04482}$

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x) = \begin{cases} \frac{2}{25}x & 0 \le x \le 5; \\ 0, & \text{otherwise.} \end{cases}$$

Compute $P(X \le 2.9)$ ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

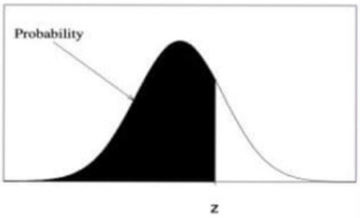
$$P(X \leq x) = \int_0^x \frac{2x}{25} dx$$ so

$$P(X \leq 2.9) = \int_0^{2.9} \frac{2x}{25} dx$$

$$P(X \leq 2.9) = [\frac{x^2}{25}]_0^{2.9} = \frac{2.9^2}{25} - \frac{0}{25} = 0.33640$$

Let X be a random variable that follows the normal distribution with $\mu_X = 0.8$ and $\sigma_X^2 = 4$.

Probabilities for the standard normal distribution



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3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
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3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Compute $P(X \leq 1.96)$. [ ] *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Compute $P(X \geq 4.94)$. [ ] *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Compute $P(X \leq 0.2)$. [ ] *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Compute $P(X \geq -1.5)$. [ ] *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

The random variable X has normal distribution.

$X \sim N(0.8, 2^2)$.

a) The probability,

$$P(X \leqslant 1.96) = P\left(Z < \frac{1.96 - 0.8}{2}\right)$$

$P(X \leqslant 1.96) = P(Z < 0.58)$

$P(X \leqslant 1.96) = \Phi(0.58)$

$P(X \leqslant 1.96) = 0.71904$

b) The probability,

$$P(X \geqslant 4.94) = P\left(Z > \frac{4.94 - 0.8}{2}\right)$$

$P(X \geqslant 4.94) = P(Z > 2.07)$

$P(X \geqslant 4.94) = \Phi(-2.07)$

$P(X \geqslant 4.94) = 0.01923$

c) The probability,

$$P(X \leqslant 0.2) = P\left(Z < \frac{0.2 - 0.8}{2}\right)$$

$P(X \leqslant 0.2) = P(Z < -0.3)$

$P(X \leqslant 0.2) = \Phi(-0.3)$

$P(X \leqslant 0.2) = 0.38209$

d) The probability,

$$P(X \geqslant -1.5) = P\left(Z > \frac{-1.5 - 0.8}{2}\right)$$

$P(X \geqslant -1.5) = P(Z > -1.15)$

$P(X \geqslant -1.5) = \Phi(1.15)$

$P(X \geqslant -1.5) = 0.87493$

The number of cars that arrive at a certain intersection follows the Poisson distribution with a rate of 1.5 cars/min.

How many cars are expected to arrive in a 2.4 minutes period? ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Let X be the number of cars that arrive in 2.4 minutes period. Determine the standard deviation of X. ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

The number of cars that arrive at a certain intersection follow the poisson distribution with a rate of 1.5 cars/min

give $\lambda = 1.5$ cars/min

Therefore the cars arrive in a 2.4 minutes period is given by $2.4 \times 1.5 = 3.6$

∴ 3.6 cars arrive in a 2.4 minutes period.

let x be the number of cars that arrive in 2.4 minutes period.

we know

The number of cars arrive at certain intersection follows poisson distribution with rate of 1.5 cars/min

Therefore in 2.4 minute, there are 3.6 cars arrive

i.e $x \sim P(\lambda)$

∴ $x \sim P(3.6)$

standard deviation $= \sqrt{\lambda}$

$= \sqrt{3.6}$

$= 1.8973665961$

$= 1.89736$

∴ The standard deviation that the number of cars arrive in 2.4 minutes is 1.89736

The lifetime X of a certain electronic component is an exponential random variable with a mean of 7 hours. Assuming 2 of these components operate independently in a device. The device operates if at least two components operate.

Find the probability that the lifetime of any electronic component is at least 2 hours. ☐

[The answer should be a number rounded to five decimal places, don't use symbols such as %]

Find the probability that the device operates for at least 2 hours. ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Answer:- Given That:-

The lifetime X of a certain electronic component is an exponential random variable with a mean of 7 hours. Assuming 2 of these components operate independently in a device. The device operates if all components operate.

Given,

Given random variable 'X' denote the lifetime of a certain electronic component.

Therefore, e(x) = 7 hours h = 1/e(x) = 1/7 hours

Therefore, X ~ Exponential (h)

$P(X \leq x) = 1 - e^{-hx}$ or

$P(X \geq x) = 1 - P(X \leq x)$

$P(X \geq x) = 1 - e(1 - e^{-hx})$

$P(X \geq x) = e^{-hx}$

$P(X \geq x) = e^{-1/7\ \ x}$

Find the probability that the lifetime of any electronic component is at least 2 hours. [The answer should be a number rounded to five decimal places, don't use symbols such as %]

P(lifetime of any component is atleast 2 hours) = $P(X \geq x)$

$= e^{-2/7}$

P =

0.75148

Find the probability that the device operates for at least 2 hours. [The answer should be a number rounded to five decimal places, don't use symbols such as %]

P(device operates for at least 2 hours) = 1 - P(none operates for at least 2 hours)

= 1 - q^2

Where q = 1 - p = 1 - 0.75148

= 0.24852 p = 1 - q^2

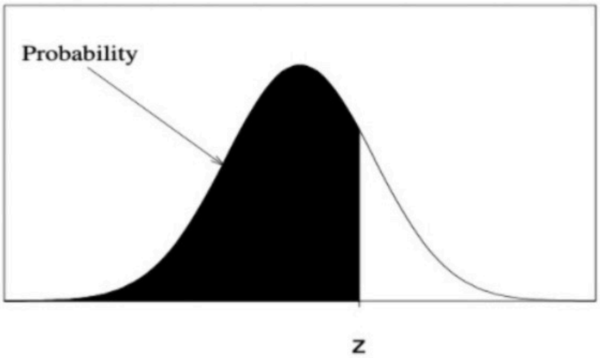
p = 1 - (0.24852 * 0.24852) p = 0.93823

Thank you for your supporting. Please upvote ny answer...

Let X be a random variable that follows the normal distribution with $\mu_X = 2$ and $\sigma_X^2 = 4$. A new random variable Y is defined by the transformation Y= | X-1 | , where $|\eta|$ is the absolute value of η. Compute $P(Y \leq 3)$. Show your work in details. If the required probability does not appear in the table below. Use the closest probability value.

Probabilities for the standard normal distribution

Table entry for z is the probability lying to the left of z



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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
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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	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	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

Answer

$X \sim N(\mu_x, \sigma_x^2)$, $\mu_x = 2$, $\sigma_x^2 = 4$.

$Y = |X-1|$

$P(Y \leq 3)$

$= P[|X-1| \leq 3]$

$= P[-3 \leq X-1 \leq 3]$

$= P[-2 \leq X \leq 4]$

~~$= P(X \leq 4) - P(X \leq -2)$~~

$= P[-4 \leq X-2 \leq 2]$

$= P[-2 \leq \frac{X-2}{2} \leq 1]$

$= P[-2 \leq Z \leq 1]$, $Z = \frac{X-2}{2} \sim N(0,1)$

$= P(Z \leq 1) - P(Z \leq -2)$

$= 0.8413 -$ ~~$(1-$~~ $P(Z \geq 2)$ [∵ Z is symmetric around 0]

$= 0.8413 - (1 - P(Z \leq 2))$

$= 0.8413 - (1 - 0.9772)$ [From the table]

$= 0.8185$

Question 1

Not yet answered

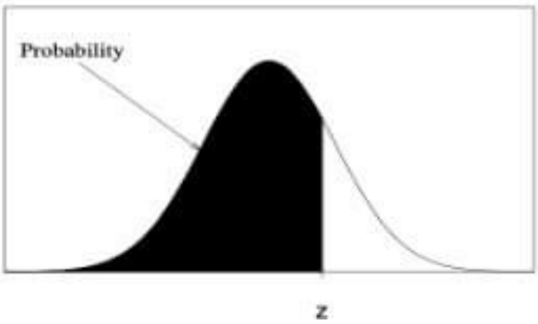
Marked out of 10.00

Flag question

Let X be a random variable that follows the normal distribution with $\mu_X = 2$ and $\sigma_X^2 = 4$. A new random variable Y is defined by the transformation $Y = (X - 1)^2$. Compute $P(Y \leq 3)$. Show your work in details. If the required probability does not appear in the table below. Use the closest probability value.

Probabilities for the standard normal distribution

Table entry for z is the probability lying to the left of z



From the observed data

Given $x \sim N(\mu_x, \sigma_x^2)$

where $\mu_x = 2$ & $\sigma_x^2 = 4 \Rightarrow \sigma_x = 2$

Now

$$P(y \le 3) = P((x-2)^2 \le 3)$$

$$P(-\sqrt{3} \le (x-2) \le \sqrt{3})$$

$$P(2-\sqrt{3} \le x \le 2+\sqrt{3})$$

$$P\left(\frac{2-\sqrt{3}-4}{2} \le \frac{x-\mu}{6} \le \frac{2+\sqrt{3}-4}{2}\right)$$

$$P\left(\frac{2-\sqrt{3}-4}{2} \le z \le \frac{2+\sqrt{3}-4}{2}\right)$$

$$P\left(z \le \frac{2+\sqrt{3}-4}{2}\right) - P\left(z \le \frac{2-\sqrt{3}-4}{2}\right)$$

$$P(z \le -0.1339) - P(-1.866)$$

$$= 0.44674 - 0.031021$$

$$= 0.415719$$

Note:

By using z-score calculator we can find the above values

→ * ←

please give up-vote, it is very important for me to do more questions friends

The number of cars that arrive at a certain intersection follows the Poisson distribution with a rate of 1.1 cars/min.

What is the probability that at least one car arrives in a 2.4 minutes period?

[The answer should be a number rounded to five decimal places, don't use symbols such as %]

What is the probability that more than two cars arrive in a 2.8 minutes period?

[The answer should be a number rounded to five decimal places, don't use symbols such as %]

Solution :

Let X be a random variable which represents the number of car that arrive at a certain intersection.

Given that, X follows Poisson distribution with a mean equal to 1.1 cars/min.

According to Poisson distribution, the probability of occurrence of exactly x events is given by,

$$P(X = x) = \frac{(e^{-\lambda})(\lambda)^x}{x!}$$

where, λ is average.

a) We have to find P(X = at least one) in t = 2.4 minutes.

We have, λ = 1.1 cars/min. = 2.64 cars/2.4 min.

P(X = at least one) = P(X ≥ 1)

P(X = at least one) = 1 - P(X < 1)

P(X = at least one) = 1 - P(X = 0)

$$P(X = at\ least\ one) = 1 - \frac{(e^{-2.64})(2.64)^0}{0!}$$

$$P(X = at\ least\ one) = 1 - \frac{(e^{-2.64}) \times 1}{1}$$

$$P(X = at\ least\ one) = 1 - 0.07136$$

$$P(X = at\ least\ one) = 0.92864$$

Hence, the required probability is 0.92864.

b) We have to find P(X > 2) in 2.8 minutes.

We have, λ = 1.1 cars/min. = 3.08 cars/2.4 min.

P(X > 2) = 1 - P(X ≤ 2)

P(X > 2) = 1 - [P(X = 0) + P(X = 1) + P(X = 2)]

$$P(X > 2) = 1 - \left[\frac{(e^{-3.08})(3.08)^0}{0!} + \frac{(e^{-3.08})(3.08)^1}{1!} + \frac{(e^{-3.08})(3.08)^2}{2!}\right]$$

$$P(X > 2) = 1 - \left[\frac{(e^{-3.08}) \times 1}{1} + \frac{3.08(e^{-3.08})}{1} + \frac{(e^{-3.08})(3.08)^2}{2 \times 1}\right]$$

$$P(X > 2) = 1 - [0.04595 + 0.14155 + 0.21799]$$

$$P(X > 2) = 1 - 0.40551$$

$$P(X > 2) = 0.59449$$

Hence, the required probability is 0.59449.

Let X be a random variable with a uniform distribution over the interval [-7 , 5].

Determine the mean of X. ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Determine the standard deviation of X. ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

If x is uniformly distributed over interval [a, b] then:

$$\text{mean} = \frac{a+b}{2}$$

$$\text{Standard deviation} = \sqrt{\frac{(b-a)^2}{12}}$$

given x is uniformly distributed over [-7, 5]

$a = -7$, $b = 5$

$$\text{mean} = \frac{-7+5}{2}$$

$$= \frac{-2}{2} = -1$$

$$\text{Standard deviation} = \sqrt{\frac{(5-(-7))^2}{12}}$$

$$= \sqrt{\frac{(12)^2}{12}}$$

$$= \sqrt{12}$$

$$= 3.46410$$

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	0.9699	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	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	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

Use the normal approximation to find the probability that a student will pass the exam? [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Ans: let us consider p is the probability that answer is correct $= \frac{1}{4} = 0.25$

$n = 52$.

since n is large so we will use here normal approximation.

$\mu = np = 52 \times 0.25 = 13$.

$\sigma = \sqrt{np(1-p)} = \sqrt{52 \times 0.25 \times 0.75} = 3.123$.

$P[x \geq 20) = P[x \geq 19.5] = P\left[z > \frac{19.5 - 13}{3.123}\right]$

$P[x \geq 20) = P[z > 2.0813) \Rightarrow 0.01870$ [from z table]

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x) = \begin{cases} \frac{3}{126}x^2 & -1 \le x \le 5; \\ 0, & \text{otherwise.} \end{cases}$$

Determine the mean of X ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

$$Mean = \int_{-1}^{5} \frac{3}{126} x^2 * x$$

$$= \frac{3}{126} \int_{-1}^{5} x^3$$

$$= \frac{3}{126} \left(\frac{5^4}{4} - \frac{(-1)^4}{4} \right)$$

$$= \frac{3}{126} \left(\frac{625}{4} - \frac{1}{4} \right)$$

$$= \frac{3}{126} * \frac{624}{4}$$

$$= 3.71429$$

A multiple-choice exam contains 57 questions, each with 4 options (one is the correct answer). Assume that a student, who did not study well on the exam, decided to just guess on each answer. To pass the exam, a student must answer at least 20 questions correctly.

Probabilities for the standard normal distribution

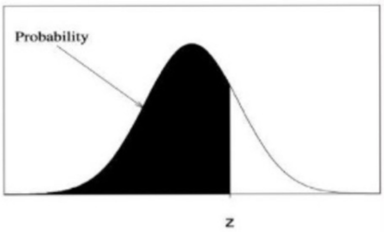


Table entry for z is the probability lying to the left of z

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	0.9699	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	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	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

Use the normal approximation to find the probability that a student will pass the exam? ______ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Let X denotes the number of correct answered questions.

n is the number of students. n= 57

p is the probability of correctly answering the questions. As they will guess . So, p =1/4

Therefore X follows binomial distribution. As n is large and p is small we can approximate it to Normal distribution with

Mean

$$\mu = np = \frac{57}{4} = 14.25$$

Standard deviation

$$\sigma = \sqrt{npq} = \sqrt{\frac{57}{4} \times \frac{3}{4}} = 3.27$$

Student will pass if he correctly answer at least 20 questions.So,

$$P(X \geq 20) = P(\frac{X-\mu}{\sigma} \geq \frac{20-\mu}{\sigma})$$

$$P(X \geq 20) = P(z \geq \frac{20-14.25}{3.27}) = P(z \geq 1.758)$$

$$P(X \geq 20) = P(z \geq 1.76) = 1 - P(z \leq 1.76) = 1 - 0.9608 = 0.0392$$

So, there is 0.0392 probability that a student will pass the exam.

The number of cars that arrive at a certain intersection follows the Poisson distribution with a rate of 1.8 cars/min.

What is the probability that at least one car arrives in a 1.6 minutes period? *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

What is the probability that more than two cars arrive in a 2.8 minutes period?

[The answer should be a number rounded to five decimal places, don't use symbols such as %]

0.94387
0.79645

The lifetime X of a certain electronic component in hours is an exponential random variable with a mean of 4.9.

Determine the variance of X. ______ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

A) Given data

X of a component is an exponential distribution with mean value =4.9

(λ)=1/4.9=0.204

We need to determine the variance of X

Formula used is

Var(X)=1/(λ^2)

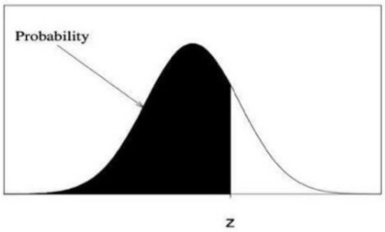
=1/(0.204^2)=24.01

=1/24.01=0.0416

A multiple-choice exam contains 57 questions, each with 4 options (one is the correct answer). Assume that a student, who did not study well on the exam, decided to just guess on each answer. To pass the exam, a student must answer at least 20 questions correctly.

Probabilities for the standard normal distribution

Table entry for z is the probability lying to the left of z



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	0.9699	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	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	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

Use the normal approximation to find the probability that a student will pass the exam? ______ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Let X denotes the number of correct answered questions.

n is the number of students. n= 57

p is the probability of correctly answering the questions. As they will guess . So, p =1/4

Therefore X follows binomial distribution. As n is large and p is small we can approximate it to Normal distribution with

Mean

$$\mu = np = \frac{57}{4} = 14.25$$

Standard deviation

$$\sigma = \sqrt{npq} = \sqrt{\frac{57}{4} \times \frac{3}{4}} = 3.27$$

Student will pass if he correctly answer at least 20 questions.So,

$$P(X \geq 20) = P(\frac{X - \mu}{\sigma} \geq \frac{20 - \mu}{\sigma})$$

$$P(X \geq 20) = P(z \geq \frac{20 - 14.25}{3.27}) = P(z \geq 1.758)$$
$$P(X \geq 20) = P(z \geq 1.76) = 1 - P(z \leq 1.76) = 1 - 0.9608 = 0.0392$$

So, there is 0.0392 probability that a student will pass the exam.

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x) = \begin{cases} \frac{2}{64}\,x & 0 \le x \le 8; \\ 0, & \text{otherwise.} \end{cases}$$

Compute $F_X(2.9)$ ☐ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Sol^n ①

$$f(x) = \begin{cases} \frac{2x}{64}, & 0 \le x \le 8 \\ 0, & o/w \end{cases}$$

$F_x(2.9) = ?$

$$F_x(x) = \int_0^x f(t)\,dt = \int_0^x \frac{2t}{64}\,dt$$

$$= \frac{2}{64} \times \frac{1}{2} \left(t^2\right)_0^x = \frac{x^2}{64}$$

$$F_x(x) = \frac{x^2}{64}$$

$$F_x(2.9) = \frac{(2.9)^2}{64} = \frac{8.41}{64} = 0.13141.$$

$$\Rightarrow \boxed{F_x(2.9) = 0.13141}$$

Compute $P(X \leq 2.52)$. [ ] [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Compute $P(X \geq 1.36)$. [ ] [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Compute $P(X \leq -0.71)$. [ ] [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Compute $P(X \geq -0.98)$. [ ] [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Here $X \sim N(\mu = 0.6, \sigma^2 = 1)$

1) $P(X \leq 2.52) = P\left(\frac{X-\mu}{\sigma} \leq \frac{2.52 - 0.6}{1}\right)$

$= P(Z \leq 1.92)$ $\quad \because Z$ is standard Normal variate

$= \boxed{0.97260}$

2) $P(X \geq 1.36) = P\left(\frac{X-\mu}{\sigma} \geq \frac{1.36 - 0.6}{1}\right)$

$= P(Z \geq 0.76)$

$= \boxed{0.22360}$

3) $P(X \leq -0.71) = P\left(\frac{X-\mu}{\sigma} \leq \frac{-0.71 - 0.6}{1}\right)$

$= P(Z \leq -1.31)$

$= \boxed{0.09510}$

4) $P(X \geq -0.98) = P\left(\frac{X-\mu}{\sigma} \leq \frac{-0.98 - 0.6}{1}\right)$

$= P(Z \leq -1.58)$

$= \boxed{0.94290}$

The number of cars that arrive at a certain intersection follows the Poisson distribution with a rate of 0.6 cars/min.

How many cars are expected to arrive in a 2.4 minutes period? ____ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Let X be the number of cars that arrive in 2.4 minutes period. Determine the standard deviation of X. ____ *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x) = \begin{cases} \frac{3}{35}x^2 & -2 \leq x \leq 3; \\ 0, & \text{otherwise.} \end{cases}$$

Determine the median of the distribution of X. [ ] *[The answer should be a number rounded to five decimal places, don't use symbols such as %]*

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x) = \begin{cases} \frac{3}{189}x^2 & -4 \le x \le 5; \\ 0, & \text{otherwise.} \end{cases}$$

Determine the variance of X. [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x) = \begin{cases} \frac{2}{36}\,x & 0 \leq x \leq 6; \\ 0, & \text{otherwise.} \end{cases}$$

Find the $E\{x^2\}$. ☐ [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Let X be a random variable that follows the normal distribution with $\mu_X = -0.9$ and $\sigma_X^2 = 9$

Probabilities for the standard normal distribution

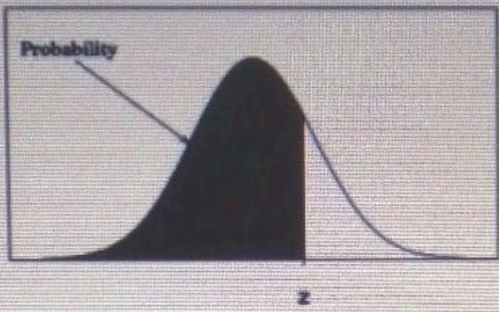


Table entry for z is the probability lying to the left of z

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	0.9699	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	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	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

Compute $P(X \le 5.04)$ [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Compute $P(X \ge 5.07)$ [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Compute $P(X \le -3.21)$ [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Compute $P(X \ge -4.89)$ [The answer should be a number rounded to five decimal places, don't use symbols such as %]

Let $f_X(x)$ be the probability density function of the random variable X.

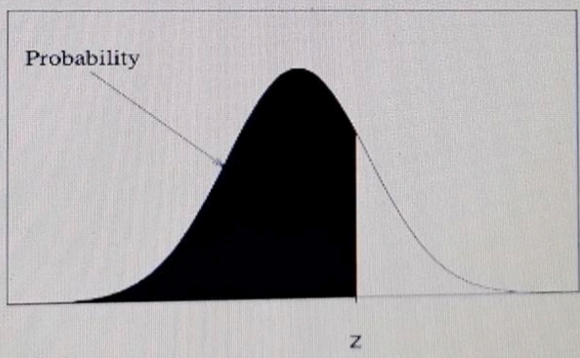
$$f(x) = \begin{cases} \frac{3}{35}x^2 & -2 \le x \le 3; \\ 0, & \text{otherwise.} \end{cases}$$

Determine the $E\{X^2\}$. *[The answer should be a number rounded to five decimal places, don't use symbols such as*

Let X be a random variable that follows the normal distribution with $\mu_X = 2$ and $\sigma_X^2 = 4$. A new random variable Y is defined by the transformation Y= | X-2 | , where $|\eta|$ is the absolute value of η. Compute $P(Y \leq 3)$. Show your work in details. If the required probability does not appear in the table below. Use the closest probability value.

Probabilities for the standard normal distribution

Table entry for z is the probability lying to the left of z



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

Let $f_X(x)$ be the probability density function of the random variable X.

$$f(x)=\begin{cases}\frac{2}{64}\ x & 0\leq[?][?]x\leq[?][?]8;\\ [?][?]0, \text{ otherwise.}\end{cases}$$

Compute $P(X\leq 3.3)$ ☐ [The answer should be a number rounded to five decimal places, don't use symbols such as %]

A multiple-choice exam contains 58 questions, each with 4 options (one is the correct answer). Assume that a student, who did not study well on the exam, decided to just guess on each answer. To pass the exam, a student must answer at least 22 questions correctly.

Use the normal approximation to find the probability that a student will pass the exam? [The answer should be a number rounded to five decimal places, don't use symbols such as %]