Question 3, Ex 3, F07

3 Mr. Drillit, the dentist of Tooth Acres, has determined from his records the probability distribution of the variable X = the number of fillings he administers in a day. The probability distribution for the random variable X is given below. Find the variance, σ^2, of X.

k	Pr(X = k)
2	$\frac{1}{8}$
3	$\frac{1}{8}$
4	$\frac{1}{2}$
5	$\frac{1}{8}$
6	$\frac{1}{8}$

(a) 0 (b) $\frac{5}{4}$ (c) $\sqrt{\frac{5}{4}}$ (d) $\frac{7}{4}$ (e) $\sqrt{\frac{7}{4}}$

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- *We must first find the mean,* $E(X) = \mu = \sum kP(X = k)$

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k	Pr(X = k)	kPr(X = k)
2	$\frac{1}{8}$	$\frac{1}{4}$
3	$\frac{1}{8}$	$\frac{3}{8}$
4	$\frac{1}{2}$	2
5	$\frac{1}{8}$	$\frac{5}{8}$
6	$\frac{1}{8}$	$\frac{6}{8}$
		$\mu = 4$

- *We must first find the mean, $E(X) = \mu = \sum kP(X = k)$. From above, or by symmetry, we see $\mu = 4$.*

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k	Pr(X = k)	kPr(X = k)	$(k-\mu)^2$	$(k-\mu)^2P(X=k)$
2	$\frac{1}{8}$	$\frac{1}{4}$	$(-2)^2 = 4$	1/2
3	$\frac{1}{8}$	$\frac{3}{8}$	$(-1)^2 = 1$	1/8
4	$\frac{1}{2}$	2	0	0
5	$\frac{1}{8}$	$\frac{5}{8}$	1	1/8
6	$\frac{1}{8}$	$\frac{6}{8}$	4	1/2
		$\mu = 4$		

- *We must first find the mean, $E(X) = \mu = \sum kP(X = k)$. From above, or by symmetry, we see $\mu = 4$.*
- *Next we must calculate $\sigma^2 = E(X-\mu)^2 = \sum (k-\mu)^2 P(X = k)$.*

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5	$\frac{1}{8}$	$\frac{5}{8}$	1	$1/8$
6	$\frac{1}{8}$	$\frac{6}{8}$	4	$1/2$
		$\mu = 4$		$\sigma^2 = 5/4$

- *We must first find the mean, $E(X) = \mu = \sum kP(X=k)$. From above, or by symmetry, we see $\mu = 2$.*
- *Next we must calculate $\sigma^2 = E(X-\mu)^2 = \sum (k-\mu)^2 P(X=k) = 5/4$.*

Question 3, Ex 3, F07

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- *Next we must calculate $\sigma^2 = E(X-\mu)^2 = \sum (k-\mu)^2 P(X=k) = 5/4$.*
- *The answer is (b).*

Question 4, Ex 3, F07

4 Find the area under the standard normal curve between $z = -1.5$ and $z = 3.1$. (a) 0.5 (b) 0.9990 (c) 0.0658 (d) 0.0010 (e) 0.9322

Question 4, Ex 3, F07

4 Find the area under the standard normal curve between $z = -1.5$ and $z = 3.1$. (a) 0.5 (b) 0.9990 (c) 0.0658 (d) 0.0010 (e) 0.9322

- *A set of tables for the standard normal curve (with mean 0 and standard deviation 1) will be provided with your exam. It will list z alongside $A(z)$, where $A(z)$ is the area under the standard normal curve to the left of z.*

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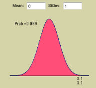
- *The area under the curve between $z = -1.5$ and $z = 3.1$, is the area under the curve to the left of $z = 3.1$ minus the area under the curve to the left of $z = -1.5$, as shown in the diagram:*



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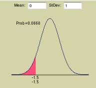

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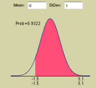

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- *In terms of the tables, this translates to: The area under the curve between $z = -1.5$ and $z = 3.1 = A(3.1) - A(-1.5)$.*

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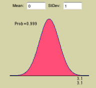

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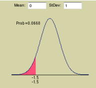

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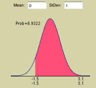

- *In terms of the tables, this translates to: The area under the curve between $z = -1.5$ and $z = 3.1 = A(3.1) - A(-1.5)$.*
- *From the tables, we see that $A(3.1) = .9990$ and $A(-1.5) = .0668$, hence the area under the curve between $z = -1.5$ and $z = 3.1 =$ $A(3.1) - A(-1.5) = .9990 - .0668 = .9322$*

z	$A(z)$
-1.5	.0668

z	$A(z)$
3.1	.9990

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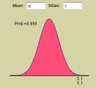

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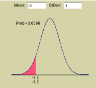

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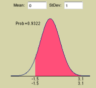

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z	$A(z)$	z	$A(z)$
-1.5	.0668	3.1	.9990

- *The correct answer is (e).*

Question 5, Ex 3, F07

5 The amount of milk contained in a gallon container is normally distributed with mean 128.2 ounces and standard deviation 0.2 ounces. What is the probability that a random bottle contains less than 128 ounces?

(a) 0.3085 (b) 0.8413 (c) 0.1587 (d) 0.6915 (e) 0.5

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- *Let X denote the amount of milk contained in a gallon container, then X is a normal Random Variable with mean* $\mu = 128.2$ *ounces and standard deviation* $\sigma = 0.2$ *ounces.*

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- *We want to calculate $Pr(X < 128)$.*
- *We standardize the varaible:* $Pr(X < 128) = Pr(\frac{X-\mu}{\sigma} < \frac{128-\mu}{\sigma}) = Pr(Z < \frac{128-128.2}{0.2}) = P(Z < -1)$.

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- *Now Z is a standard normal random variable (with mean zero and standard devaition 1), hence we can use the tables to calculate* $P(Z < -1) = .1587$.

z	$A(z)$
-1	.1587

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z	$A(z)$
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- *The correct answer is (c).*