Poisson Probability Distribution Solutions

Computer Sales

A computer salesman averages 1.8 sales per week (7-days). In the next week, what's the probability the computer salesman will have:

Approximate your answers to the nearest thousandths.

 $\mu = 1.8$ sales per week x = # of sales

1. No Sales? x = 0

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PoissonPdf µ:1.8 x value:0 Paste	PoissonPdf(1.8,0) 0.1652988882
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 $p(0) \approx 0.165$

2. One sale? *x* = 1

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 $p(1) \approx 0.298$

3. At least one sale? $x \ge 1$

$$p(x \ge 1) = p(1) + p(2) + p(3) + \dots = 1 - p(0) \approx 0.835$$

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4. No more than one girl? $x \leq 1$

 $p(x \le 1) = p(0) + p(1) \approx 0.463$

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5. More than one sale? x > 1

 $p(x > 1) = p(2) + p(3) + p(4) + \dots = 1 - p(0) - p(1) \approx 0.537$

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6. In the next day, what's the probability there will be two sales?

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\frac{1.8}{7}=\frac{\mu}{1}\,\rightarrow\,\mu\approx\,0.\,257\, per day
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                                         y= window zoom trace graph
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x = 2

p(2) pprox 0.026Not Likely 7. In the next 3-day interval, what's the probability there will be more than two sales?

x > 2

$\frac{1.8}{7} = \frac{\mu}{3}$	$ ightarrow \mu = rac{3\cdot 1.8}{7} pprox 0.771 ightarrow \mu pprox 0.771$ per 3-day
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	(3*1.8)/7 0.7714285714
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 $p(x > 2) = p(3) + p(4) + p(5) + \dots = 1 - p(0) - p(1) - p(2) \approx 0.043$ Not Likely

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911 Calls

Emergency service experiences a mean of 4.2 calls per day (24 hours). In the next day, what's the probability there will be:

Approximate your answers to the nearest thousandths.

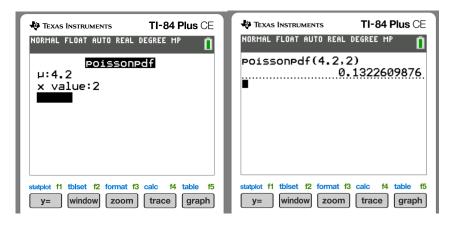


8. No calls? x = 0

TI-84 Plus CE HORMAL FLOAT AUTO REAL DEGREE MP PoissonPdf µ:4.2 x value:0	TEXAS INSTRUMENTS TI-84 Plus CE NORMAL FLOAT AUTO REAL DEGREE MP POISSONPdf(4.2,0) 0.0149955768
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y= window zoom trace graph $p(0) \approx$	y= window zoom trace graph

Not Likely

9. Two calls? x = 2



 $p(2) \approx 0.132$

10. More than two calls? x > 2

 $p(x > 2) = p(3) + p(4) + p(5) + \dots = 1 - p(0) - p(1) - p(2) \approx 0.790$

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11. At least one call? $x \ge 1$

$$p(x \ge 1) = p(1) + p(2) + p(3) + \dots = 1 - p(0) \approx 0.985$$

Almost Certain

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12. Between one and four calls? $1 \le x \le 4$

$$p(1 \le x \le 4) = p(1) + p(2) + p(3) + p(4) \approx 0.575$$

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13. In the next, hour what's the probability there will be more than three calls?

x > 3

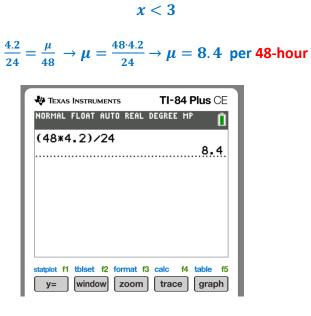
 $rac{4.2}{24} = rac{\mu}{1} o \mu = rac{4.2}{24} o \mu = 0.175$ per hour

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 $p(x > 3) = p(4) + p(5) + p(6) + \dots = 1 - p(0) - p(1) - p(2) - p(3) \approx 0.000034 \approx 0.000$ Not Likely

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14. In the next two days (48-hour time interval), what's the probability there will be less than three calls?



$p(x < 3) = p(0) + p(1) + p(2) \approx 0.010$ Not Likely

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Lightning Strikes

The number of lightning strikes on ELAC Mountain occurs at a mean rate of 3.6 per year (365-days). In the next year, what's the probability there will be:

Approximate your answers to the nearest thousandths.

$\mu = 3.6$ lightning Strikes per year x = # of lightning strikes

15. Four lightning strikes? x = 4

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 $p(4) \approx 0.191$

16. More than three lightning strikes? x > 3

 $p(x > 3) = p(4) + p(5) + p(6) + \dots = 1 - p(0) - p(1) - p(2) - p(3) \approx 0.485$

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17. At least two lightning strikes? $x \ge 2$

$$p(x \ge 2) = p(2) + p(3) + p(4) + \dots = 1 - p(0) - p(1) \approx 0.874$$

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18. Less than two lightning strikes? x < 2

 $p(x < 2) = p(0) + p(1) \approx 0.126$

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19. No more than one lightning strikes? $x \leq 1$

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 $p(x \le 1) = p(0) + p(1) \approx 0.125$

20. In the next 90 days, what's the probability there will be at least one lightning strike? $x \ge 1$

$$\frac{3.6}{365} = \frac{\mu}{90} \rightarrow \mu = \frac{90 \cdot 3.6}{365} \rightarrow \mu = 0.888$$
 per 90-day

$$p(x \ge 1) = p(1) + p(2) + p(3) + \dots = 1 - p(0) \approx 0.589$$

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21. In the next, 30 days, what's the probability there will be a lightning strike? x = 1

$$rac{3.6}{365} = rac{\mu}{30}
ightarrow \mu = rac{30\cdot 3.6}{365}
ightarrow \mu = 0.296$$
 per 30-day

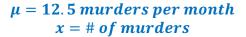
 $p(1) \approx 0.220$

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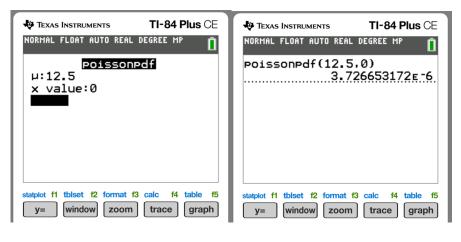
Murders

St Vegas experiences an average of 12.5 murders per month (30-day interval). In the next month, what's the probability there will be:

Approximate your answers to the nearest thousandths.

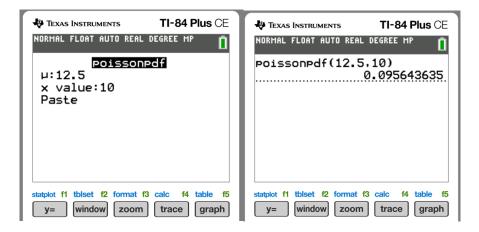


22. No murders? x = 0



p(0) pprox 0.00000373 pprox 0.000Not Likely

23. Ten murders? x = 10



 $p(10) \approx 0.096$

24. More than five murders? x > 5

 $p(x > 5) = p(6) + p(7) + p(8) + \dots = 1 - p(0) - p(1) - p(2) - p(3) - p(4) - p(5)$ \$\approx 0.985\$

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Almost Certain

25. No more than three murders? $x \leq 3$

p(x	\leq	3)	=	p (0)	$\pm j$	p(1)) +	p (2	2)	+ 1	p(3)	\approx	0.	002
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26. Less than six murders? x < 6

$$p(x < 6) = p(0) + p(1) + p(2) + p(3) + p(4) + p(5) \approx 0.015$$

Not Likely

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27. In the next week (7-day interval), what's the probability there will be two murders? x = 2

$$\frac{12.5}{30} = \frac{\mu}{7} \rightarrow \mu = \frac{7 \cdot 12.5}{30} \rightarrow \mu = 2.917$$
 per 7-day

 $p(2) \approx 0.230$

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28. In the next year (365 days), what's the probability there will be at least two murders? $x \ge 2$

 $rac{12.5}{30} = rac{\mu}{365}
ightarrow \mu = rac{365 \cdot 12.5}{30}
ightarrow \mu = 152.\,083$ per 365-day

 $p(x \ge 2) = p(2) + p(3) + p(4) + \dots = 1 - p(0) - p(1) \approx 1$ Almost Certain

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Earthquakes

California experiences 1 Big One (earthquake above 6.0 on the Southern section of the San Andreas Fault) every 500 years. In the next year) what's the probability there will be: **Approximate your answers to the nearest thousandths.**



29. A big one? **x** = **1**

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 $p(1) \approx 0.002$ Not Likely

30. At least one big one? $x \ge 1$

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p(x \ge 1) = p(1) + p(2) + p(3) + \dots = 1 - p(0) \approx 0.002
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31. More than one big one? x > 1

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p(x > 1) = p(2) + p(3) + p(4) + \dots = 1 - p(0) - p(1) \approx 0.000002 \approx 0.000
Not Likely
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32. Two big ones? x = 2

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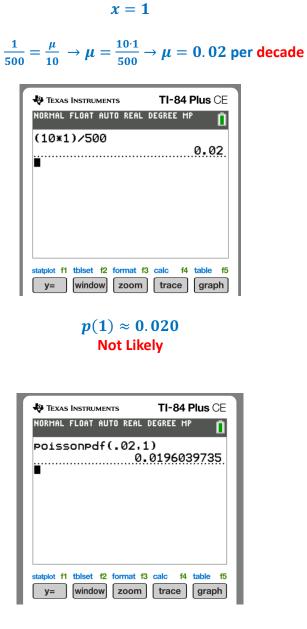
 $p(2) \approx 0.000002 \approx 0.000$ Not Likely 33. No more than two big ones? $x \leq 2$

$$p(x \le 2) = p(0) + p(1) + p(2) \approx 1.000$$

Almost Certain

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34. In the next decade (10 years), what's the probability there will be a big one?



35. In the next century (100-years), what's the probability there will be more than two big ones?

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x > 2
\frac{1}{500} = \frac{\mu}{100} \rightarrow \mu = \frac{100 \cdot 1}{500} \rightarrow \mu = 0.2 \text{ per century}
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 $p(x > 2) = p(3) + p(4) = p(5) + \dots = 1 - p(0) - p(1) - p(2) \approx 0.001$

Not Likely

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