

11.11.11

1. ឧបករណ៍ប្រើប្រាស់ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

1.1 ប្រសិនបើ ឧបករណ៍ ១ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

$$S = \{1, 2, 3\} \quad f(x) = \frac{1}{3} \quad ; \quad x = 1, 2, 3$$

1.2 ប្រសិនបើ ឧបករណ៍ ២ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

$$S = \{1, 2, 3\} \quad f(x) = \frac{1}{3} \quad ; \quad x = 1, 2, 3$$

1.3 ប្រសិនបើ ឧបករណ៍ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

$$S = \{1, 2, 3\} \quad f(x) = \frac{1}{3} \quad ; \quad x = 1, 2, 3$$

2. ឧបករណ៍ប្រើប្រាស់ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

ឧបករណ៍ប្រើប្រាស់ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

$$P(x=1) = \frac{\binom{9}{1} \binom{1}{1}}{\binom{10}{2}} = \frac{1}{12}$$

$$P(x=2) = \frac{\binom{9}{2} \binom{1}{0}}{\binom{10}{2}} = \frac{5}{12}$$

$$P(x=3) = \frac{\binom{9}{3} \binom{1}{0}}{\binom{10}{3}} = \frac{1}{12}$$

3. ប្រសិនបើ ឧបករណ៍ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

$$f(x) = \begin{cases} \frac{x}{9} & , \quad x = 1, 2, 3 \\ 0 & , \quad x \text{ គឺជា ឧបករណ៍ប្រើប្រាស់ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា} \end{cases}$$

1.1 ប្រសិនបើ ឧបករណ៍ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

$$f(x) = \begin{cases} 0 & , \quad x > 3 \\ \frac{1}{9} & , \quad 1 \leq x \leq 3 \\ \frac{2}{9} & , \quad 3 \leq x \leq 5 \\ \frac{3}{9} & , \quad x \geq 5 \end{cases}$$

1.2 ប្រសិនបើ ឧបករណ៍ ៣ ឆ្នាំ ដំបូង ១, 2, 3 ឆ្នាំ គឺជា

$$E(x) = \sum x f(x) = \frac{1}{9} + \frac{2}{9} + \frac{25}{9} = \frac{35}{9} = 3.889$$

$$E(x^2) = \sum x^2 f(x) = \frac{1}{9} + \frac{4}{9} + \frac{125}{9} = \frac{130}{9}$$

$$V(x) = E(x^2) - (E(x))^2 = \frac{130}{9} - \left(\frac{35}{9}\right)^2 = 1.8965$$

$$M_x(t) = E(e^{tx}) = \sum e^{tx} f(x) = \frac{e^t}{9} + \frac{2e^{2t}}{9} + \frac{5e^{3t}}{9}$$



4. លេខ 7 ខ្លី  $X$  ដែល លេខ 7 ខ្លី ត្រូវបាន រៀបចំ ឡើង ពី លេខ 7 ខ្លី ដែល មាន លេខ 7 ខ្លី

$$f(x) = \begin{cases} \frac{|x-2|+1}{15} & , x = -2, -1, 0, 1, 2 \\ 0 & , x \text{ ខ្លី លេខ 7 ខ្លី} \end{cases}$$

4.1

0.1 គណនា  $P(X \leq 0)$   $P(-1 < X \leq 3)$   $P(X \geq 1)$

= គណនា លេខ 7 ខ្លី

4.2 គណនា លេខ 7 ខ្លី ដែល លេខ 7 ខ្លី ត្រូវបាន រៀបចំ ឡើង ពី លេខ 7 ខ្លី ដែល មាន លេខ 7 ខ្លី  $X$

= គណនា លេខ 7 ខ្លី

4.3 គណនា  $E(2X+1)$  និង  $Var(3X+2)$

=  $E(2X+1) = 2E(X)+1$

=  $2(-0.887)+1$

=  $-0.374$

$Var(3X+2) = 3^2 Var(X)$

=  $9 Var(X) = 9 (1.556) = 14$

5. លេខ 7 ខ្លី  $X$  ដែល លេខ 7 ខ្លី ត្រូវបាន រៀបចំ ឡើង ពី លេខ 7 ខ្លី ដែល មាន លេខ 7 ខ្លី ដែល មាន លេខ 7 ខ្លី  $X$

$$f(x) = \begin{cases} \frac{1}{6} & , x = 1, 2, \dots, 6 \\ 0 & , x \text{ ខ្លី លេខ 7 ខ្លី} \end{cases}$$

គណនា  $E(X) = \sum x f(x)$

$$= \frac{1(1)^2}{6} + \frac{1(2)^2}{6} + \frac{1(3)^2}{6} + \frac{1(4)^2}{6} + \frac{1(5)^2}{6} + \frac{1(6)^2}{6}$$

គណនា  $Var(X)$

$Var(X) = E(X^2) - M^2$

$E(X^2) = \sum x^2 f(x)$

$$= \frac{1(1)^2}{6} + \frac{1(2)^2}{6} + \frac{1(3)^2}{6} + \frac{1(4)^2}{6} + \frac{1(5)^2}{6} + \frac{1(6)^2}{6} = 91 - (35)^2 = 2.9167$$



6. Η κατανομή  $X$  που έχει πιθανότητες  $f(x)$  είναι:

$$f(x) = \begin{cases} k(5-x) & , x = 0, 1, 2, 3, 4 \\ 0 & , x = \text{άλλο τιμή} \end{cases}$$

6.1 βρείτε  $k$

$$\sum f(x) = 1 \quad \text{ήτοι} \quad 5k + 4k + 3k + 2k + k = 15k$$

$$\text{άρα} \quad 15k = 1 \quad \therefore k = \frac{1}{15} = 0.0666$$

6.2 βρείτε  $P(1 \leq X \leq 3)$

$$= P(X=1) + P(X=2) + P(X=3)$$

$$= \frac{4}{15} + \frac{3}{15} + \frac{2}{15} = \frac{9}{15} = 0.6$$

6.3 βρείτε  $E(X)$  και  $Var(X)$

$$E(X) = \sum x f(x) = 0\left(\frac{5}{15}\right) + 1\left(\frac{4}{15}\right) + 2\left(\frac{3}{15}\right) + 3\left(\frac{2}{15}\right) + 4\left(\frac{1}{15}\right) = \frac{4}{3} = 1.333$$

$$E(X^2) = \sum x^2 f(x) = 0\left(\frac{5}{15}\right) + 1\left(\frac{4}{15}\right) + 4\left(\frac{3}{15}\right) + 9\left(\frac{2}{15}\right) + 16\left(\frac{1}{15}\right) = \frac{10}{3} = 3.333$$

$$Var(X) = E(X^2) - (E(X))^2 = 3.333 - (1.333)^2 = 1.555$$

$$M_X(t) = E(e^{tx}) = \sum e^{tx} f(x) = \frac{5}{15} + \frac{4e^t}{15} + \frac{3e^{2t}}{15} + \frac{2e^{3t}}{15} + \frac{e^{4t}}{15}$$

7. Η κατανομή  $X$  που έχει πιθανότητες  $f(x)$  είναι:

$$f(x) = \begin{cases} a-bx & , x = 0, 1, 2 \\ 0 & , x = \text{άλλο τιμή} \end{cases} \quad \begin{aligned} \sum f(x) &= 1 \\ \sum x f(x) &= 0.8 \end{aligned}$$

βρείτε  $a$  και  $b$

7.1 βρείτε  $a$  και  $b$

$$E(X) = \sum x f(x) \rightarrow (a-b) + 2(a-2b) = 0.8$$

$$(a-b) + (2a-4b) = 0.8$$

$$3a - 5b = 0.8 \quad \text{--- (1)}$$

$$\sum f(x) \rightarrow a + (a-b) + (a-2b) = 1$$

$$3a - 2b = 1 \quad \text{--- (2)}$$

$$\begin{aligned} 3a - 2b - 3a + 5b &= 1 - 0.8 \\ 2b &= 0.2 \\ b &= 0.1 \end{aligned}$$

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$$3a - 3(0.1) = 1$$

$$3a = 1 + 0.3$$

$$3a = 1.3$$

$$a = 0.433$$

7.2 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) 21) 22) 23) 24) 25) 26) 27) 28) 29) 30) 31) 32) 33) 34) 35) 36) 37) 38) 39) 40) 41) 42) 43) 44) 45) 46) 47) 48) 49) 50) 51) 52) 53) 54) 55) 56) 57) 58) 59) 60) 61) 62) 63) 64) 65) 66) 67) 68) 69) 70) 71) 72) 73) 74) 75) 76) 77) 78) 79) 80) 81) 82) 83) 84) 85) 86) 87) 88) 89) 90) 91) 92) 93) 94) 95) 96) 97) 98) 99) 100)

$$E(x) = \sum x^2 f(x)$$

$$= 0 + 0.3113 + 0.9332 = 1.2445$$

$$b = \sqrt{E(x^2) - \mu^2}$$

$$= \sqrt{1.2445 - (0.8)^2}$$

$$= 0.7915$$

8. 1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) 21) 22) 23) 24) 25) 26) 27) 28) 29) 30) 31) 32) 33) 34) 35) 36) 37) 38) 39) 40) 41) 42) 43) 44) 45) 46) 47) 48) 49) 50) 51) 52) 53) 54) 55) 56) 57) 58) 59) 60) 61) 62) 63) 64) 65) 66) 67) 68) 69) 70) 71) 72) 73) 74) 75) 76) 77) 78) 79) 80) 81) 82) 83) 84) 85) 86) 87) 88) 89) 90) 91) 92) 93) 94) 95) 96) 97) 98) 99) 100)

$$f(x) = \begin{cases} 0 & , x < 0 \\ \frac{1}{3}k & , 0 \leq x \leq 1 \\ \frac{1}{3}k + \frac{1}{2} & , x \geq 1 \end{cases}$$

8.1 1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) 21) 22) 23) 24) 25) 26) 27) 28) 29) 30) 31) 32) 33) 34) 35) 36) 37) 38) 39) 40) 41) 42) 43) 44) 45) 46) 47) 48) 49) 50) 51) 52) 53) 54) 55) 56) 57) 58) 59) 60) 61) 62) 63) 64) 65) 66) 67) 68) 69) 70) 71) 72) 73) 74) 75) 76) 77) 78) 79) 80) 81) 82) 83) 84) 85) 86) 87) 88) 89) 90) 91) 92) 93) 94) 95) 96) 97) 98) 99) 100)

$$\frac{1}{3}k + \frac{1}{2} = 1$$

$$\frac{2k+1}{6} = 1$$

$$2k+1 = 6 \quad \therefore k = \frac{5}{2} = 2.5$$



9. 1.  $P(X \leq 0), P(0 < X \leq 1), P(X=1)$

$$P(X \leq 0)$$

$$\frac{1}{2} = 0.5$$

$$P(0 < X \leq 1)$$

$$\frac{1}{2} = 0.5$$

$$P(X=1)$$

$$\frac{1}{2} = 0.5$$

$$f(x) = \begin{cases} \frac{1}{2}k & , x=0 \\ \frac{1}{2} & , x=1 \\ 0 & , x: \text{different values} \end{cases}$$

9. 2.  $P(X=1)$   $P(X=2)$   $P(X=3)$   $P(X=4)$   $P(X=5)$   $P(X=6)$   $P(X=7)$   $P(X=8)$   $P(X=9)$   $P(X=10)$

$$f(x) = \begin{cases} k \left(\frac{4}{5}\right)^x & , x=1, 2, 3, 4, \dots \\ 0 & , x: \text{different values} \end{cases}$$

9. 3.  $k$

$$\sum f(x) = 1$$

$$f(x) = \frac{4}{5}k + \frac{16}{25}k + \frac{64}{125}k + \frac{256}{625}k + \dots$$

$$1 = \frac{4}{5}k + \left( \frac{16}{25} + \frac{64}{125} + \frac{256}{625} + \dots \right)$$

$$1 = \frac{4}{5}k \left[ \frac{1}{1 - \frac{4}{5}} \right] \rightarrow \frac{a_1}{1-r} \text{ geometric series}$$

$$4k = 1$$

$$k = \frac{1}{4} = 0.25$$

10.  $P(X=1)$   $P(X=2)$   $P(X=3)$   $P(X=4)$   $P(X=5)$   $P(X=6)$   $P(X=7)$   $P(X=8)$   $P(X=9)$   $P(X=10)$

$$E(X(X-2)) = 4$$

$$\text{Var}(-3X+5) = 9$$

$$E(X^2 - 2X) = 4$$

$$\text{Var}(-3X+5) = 9 \text{ Var}(X)$$

$$E(X^2) - 2E(X) = 4$$

$$= 9(2-2)^2$$

$$E(X^2) - 2(2) = 4$$

$$= 9(6)$$

$$E(X^2) = 8$$

$$= 54$$

11. បំណងរក  $X$  ដែលមានលក្ខណៈ ឯកត្យក្ស តាមការសង្ខេបខាងក្រោម

$$M_X(t) = \frac{1}{10} + \frac{2e^{2t}}{10} + \frac{e^{3t}}{10} + \frac{3e^{4t}}{10} + \frac{3e^{6t}}{10}$$

បំណងរក  $X$  ដែលមានលក្ខណៈ ឯកត្យក្ស តាមការសង្ខេបខាងក្រោម

$$f(x) = \frac{1}{10}, \quad x = 0, 2$$

$$f(x) = \frac{2}{10}, \quad x = 1$$

$$f(x) = \frac{2}{10}, \quad x = 3, 4$$

12. បំណងរក  $X$  ដែលមានលក្ខណៈ ឯកត្យក្ស តាមការសង្ខេបខាងក្រោម

$$M'_X(t) = \frac{d}{dt} M_X(t) = \frac{9e^{3t}}{12} + \frac{20e^{5t}}{12} + \frac{30e^{6t}}{12}$$

បំណងរក  $X$  ដែលមានលក្ខណៈ ឯកត្យក្ស តាមការសង្ខេបខាងក្រោម

បំណងរក  $X$  ដែលមានលក្ខណៈ ឯកត្យក្ស តាមការសង្ខេបខាងក្រោម

$$f(x) = \frac{3}{12}, \quad x = 3$$

$$f(x) = \frac{4}{12}, \quad x = 5$$

$$f(x) = \frac{5}{12}, \quad x = 6$$

$$M'_X(0) = E(X) = \frac{9e^{3(0)}}{12} + \frac{20e^{5(0)}}{12} + \frac{30e^{6(0)}}{12} = \frac{59}{12} = 4.916$$

$$M''_X(t) = \frac{d}{dt} M'_X(t) = \frac{27e^{3t}}{12} + \frac{100e^{5t}}{12} + \frac{180e^{6t}}{12}$$

$$M''_X(0) = E(X^2) = \frac{27e^{3(0)}}{12} + \frac{100e^{5(0)}}{12} + \frac{180e^{6(0)}}{12} = \frac{307}{12} = 25.5833$$

$$\text{Var}(X) = E(X^2) - (E(X))^2 = 25.5833 - (4.916)^2 = 1.4094$$



အကျဉ်းချုပ်

အမှတ်အသား

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အမှတ်အသား

NO.

DATE

4.1 ဘဝ  $P(X \leq 0)$   $P(-1 < X \leq 3)$   $P(X \geq 1)$

$P(X \leq 0) = P(X = -2) + P(X = -1) + P(X = 0)$

$$= \frac{1-2}{15} + \frac{-1-2}{15} + \frac{0-2}{15} = \frac{5}{15} + \frac{4}{15} + \frac{3}{15} = \frac{12}{15} = 0.8$$

$P(-1 < X \leq 3) = P(X = 0) + P(X = 1) + P(X = 2)$

$$= \frac{0-2}{15} + \frac{1-2}{15} + \frac{2-2}{15} = \frac{3}{15} + \frac{2}{15} + \frac{1}{15} = \frac{6}{15} = 0.4$$

$P(X \geq 1) = P(X = 1) + P(X = 2)$

$$= \frac{1-2}{15} + \frac{2-2}{15} = \frac{2}{15} + \frac{1}{15} = \frac{3}{15} = 0.2$$

4.2 ဘဝ အမှတ်အသား အမှတ်အသား အမှတ်အသား အမှတ်အသား အမှတ်အသား အမှတ်အသား

$E(X) = \sum x f(x) = -2 \left( \frac{5}{15} \right) + -1 \left( \frac{4}{15} \right) + 0 \left( \frac{3}{15} \right) + 1 \left( \frac{2}{15} \right) + 2 \left( \frac{1}{15} \right) = \frac{-2}{3} = -0.667$

$E(X^2) = \sum x^2 f(x) = 4 \left( \frac{5}{15} \right) + \left( \frac{4}{15} \right) + 0 \left( \frac{3}{15} \right) + \left( \frac{2}{15} \right) + 4 \left( \frac{1}{15} \right) = 2$

$\text{Var}(X) = E(X^2) - [E(X)]^2 = 2 - (-0.667)^2 = 1.556$

$M_X(t) = E(e^{tx}) = \sum e^{tx} f(x) = \frac{5e^{-2t}}{15} + \frac{4e^{-t}}{15} + \frac{3}{15} + \frac{2e^t}{15} + \frac{e^{2t}}{15}$