IDSC 6490

Final Work Book Part 2

1. Suppose Mike hits free throws from the line @ a constant rate of 20%.
(I'm a bad basket-ball player *LOL*)

Suppose Mike makes 6 free-throws.

(a) What is the probability Mike makes 3? (makes 3 of the possible 6 attempts)

$\boxed{\text{Note} \quad p = .2 \quad q = 1 - p = .8 \quad n = 6}$

Hopefully this can be seen to be

drats *LOL* I don't have a pencil *LOL*

a binomial distribution.

(a) Cont. Then $P(X=3)$ is

$$C(6,3)(.2)^3(.8)^{6-3} = C(6,3)(.2)^3(.8)^3$$

$\cong$ 8.2 % according to WolfRam ☺.

(b) What is the probability that Mike makes more than 2 free-throws? i.e. $P(X>2)$

This is $P(X\geq 3)$ =

$$P(X=3)+P(X=4)+P(X=5)$$
$$+P(X=6).$$

↖ Not fun to compute.

(b) Cont. If you are doing these by "hand" then it would be easiest to do $1 - P(X \le 2)$ i.e. $P(A) = 1 - P(A')$, however — go to Wolfram Alpha widgets Binomial Distribution Calculator

probability $\boxed{X > 2}$

$n = \boxed{6}$

$p = \boxed{.2}$

this can be changed

Wolfram says $\approx 9.88\%$

(c) what is the probability that Mike makes between 3 and 5 free-throws (inclusive) i.e.

$P(3 \leq X \leq 5)$ which is

$P(X=3) + P(X=4) + P(X=5)$?

This is $P(X \leq 5) - P(X \leq 2)$

drops out 2 and below but leaves in 3

Once again Wolfram Alpha!

(c) Cont.

So we need to fiddle about with $<$ vs $\le$ as we don't have this.

$$P(3 \le X \le 5) = P(X \le 5) - P(X \le 2)$$

This is $P(X < 6) - P(X < 3)$

Probability	$\boxed{X<6}$	minus	Probability	$\boxed{X<3}$
$n =$	$\boxed{6}$	$-$	$n =$	$\boxed{6}$
$p =$	$\boxed{.2}$		$p =$	$\boxed{.2}$

↓ Hit the go button

$.999936 \; - \; .90112 \approx .0988$

or

9.88%

2 Consider the function $f(x) = bx^2$.

(a) Determine b so that $f(x)$ can be considered a probability distribution on $[0, 2]$.

We need $\int_0^2 bx^2\,dx = 1$ so

$$\left.\frac{bx^3}{3}\right|_0^2 = 1$$

$$\frac{b(2)^3}{3} - \frac{b(0)^3}{3} = 1$$

$$\Rightarrow \frac{b(8)}{3} = 1 \quad \text{or} \quad \frac{8}{3}b = 1$$

So $b = 3/8$

$\longrightarrow$

So on $[0,2]$, $f(x) = \frac{3}{8}x^2$ can be considered a proper probability distribution.

(b) Find $P(1 \le X \le \frac{3}{2})$

This is $\displaystyle\int_1^{3/2} \frac{3}{8}x^2\,dx = \frac{x^3}{8}\Big|_1^{3/2}$

$$= \frac{(\frac{3}{2})^3}{8} - \frac{(1)^2}{8} = \frac{27}{64} - \frac{8}{64} = \frac{19}{64}$$

about 29.69 %

(c) Find $P(X>1)$.

This is $1-P(X\leq 1)$

$$1-\int_0^1 \frac{3}{8}x^2\,dx$$

Remember $[0,2]$ is the interval so it stops at 0 on the low end 🙂

$$=1-\left[\frac{x^3}{8}\Big|_0^1 = \frac{(1)^3}{8}-\frac{(0)^3}{8}\right]$$

$$=1-\frac{1}{8}=\frac{7}{8}$$

87.5 %

A good movie to do your Final exam by ☺