STAT3021 Lab10

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5.5

(a) X: times of failures due to operator error of the next 20 pipework

$X \sim Bin(0.3, 20)$

$P(X \geq 10) = 1 - P(X \leq 9) = 1 - 0.9520 = 0.0480.$

```
pbinom(9, 20, 0.3)  # P(X<=9)
```

```
## [1] 0.9520381
```

(b) $P(X \leq 4)$?

(c) Solution: P(X = 5) = 0.1789. This probability is not very small so this is not a rare event. Therefore, P = 0.30 is reasonable.

```
dbinom(5, 20, 0.3)  # P(X=5)
```

```
## [1] 0.1788631
```

My opinion: Here actually we are performing hypothesis testing. Intuitively, we want to know whether "Probability for a failure due to operation error is 0.3" is correct or not.

(d) Mean and Variance.

$X \sim Bin(p, n), P(X = k) = C_n^k p^k (1-p)^{n-k}$

$\mathbb{E}X = \sum_{k=0}^{n} kP(X = k) = np$

$VarX = \mathbb{E}X^2 - (\mathbb{E}X)^2 = np(1-p)$

5.6

(a) $X \sim Bin(0.5, 6)$ $P(2 \leq X \leq 5)$?

(b) $P(X < 3)$?

Remark: cumulative distribution function(CDF) and probability mass function(PMF).

6.4

X: waiting time for next bus

$X \sim U([0, 10])$

> Some students automatically assume that the distribution is normal and try to calculate z-score. Please emphasize that the question states the distribution is uniformly distributed.
>
> –Yuyoung

(a) $P(7 \leq X)$?

(b) Omit.

6.6

See scratch

$Z \sim N(0, 1)$

```
mean=0;sd=1;q=0.5;p=0.5
pnorm(q, mean, sd)
```

```
## [1] 0.6914625
```

```
qnorm(p, mean, sd)
```

```
## [1] 0
```

6.7

Same as 6.6

6.9

$X \sim N(\mu, \sigma^2)$, then $\frac{X-\mu}{\sigma} \sim N(0, 1)$

Refer to this note.