

Take Home 1 (S520)

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1.

a)

Given that there are 157 girls out of 329 children

Percentage of Child being girl = 48.5%

Probability(Child being girl) = 0.485

$P(X \geq 157) = 1 - P(X < 157)$

$p = 1 - \text{pbinom}(156, 329, 0.485)$

```
p= 1- pbinom(156,329,0.485)
```

```
p
```

```
## [1] 0.6321467
```

b) As mentioned in the problem probability of giving birth to a girl may depend on factors like characteristics of parents e.g. physical beauty hence we can say that probability depends on genes of parents and may also depend on external factors like climate and environment (more or less polluted) hence we can conclude that sexes of children in study might not be independent.

2.

Since there are only two choices for answers i.e. True or False We can say that correct answer is either true or false

Hence Probability of correct answer, $P(\text{Correct}) = 0.5$

Probability of atleast 8 correct answer is $P(X \geq 8) = 1 - P(X < 7)$

$= 1 - \text{pbinom}(7, 10, 0.5) = 0.054$

Now we need to find that at least one chimpanzee gets 8 or more questions correct.

$$P(M \geq 1) = 1 - P(M < 1)$$

```
m= 1- pbinom(0,10,0.054)
m
## [1] 0.4260007
```

3.

a) Let Median of Y be q_2

$$P(Y \leq q_2) = 0.5 \quad P(|X| \leq q_2) = 0.5 \quad P(-q_2 \leq X \leq q_2) = 0.5$$

Since X is standard normal variable so it is symmetric hence we can say that

```
qnorm(0.75)
## [1] 0.6744898
```

b) $P(1 < Y < 2) = F_2 - F_1$

Where $F_2 = \text{pnorm}(2) - \text{pnorm}(-2)$ and $F_1 = \text{pnorm}(1) - \text{pnorm}(-1)$

```
f2= pnorm(2)- pnorm(-2)
f1= pnorm(1)- pnorm(-1)
f2-f1
## [1] 0.2718102
```

c) 0.95 quantile of Y is

```
x=rnorm(10000)
y=abs(x)
quantile(y,0.95)
##      95%
## 1.96611
```