18.20(a)

$$P[X > m] = \frac{1}{2^m}$$

$$P[X > m] = \frac{1}{2^m}$$

$$P[\min(X, Y) \leq m] = 1 - P[X > m \; and \; Y > m]$$

$$= 1 - \frac{1}{2^{2m}}$$

18.33

(l)

Not binomial

(m)

Binomial

(o)

(i)

Not binomial

(ii)

Not binomial

(p)

Binomial

(q)

Not binomial

19.11

	4 heads	3 heads	2 heads	1 heads	0 heads
possibilities	1/16	4/16	6/16	4/16	1/16

Win: more heads than tails, which is in total 5/16 chance.

$$Expected = \frac{5}{16} * 10 - \frac{11}{16} * (x)$$

$$= \frac{50}{16} - \frac{11x}{16}$$

19.35

$$P[fair\ |10\ heads] = \frac{P[10\ heads\ \cap fair]}{P[10\ heads]} = \frac{\frac{1024}{1025} * \frac{1}{2^{10}}}{P[10\ heads]} = \frac{\frac{1}{1025}}{P[10\ heads]}$$

$$P[biased\ |10\ heads] = \frac{P[10\ heads\ \cap biased]}{P[10\ heads]} = \frac{\frac{1}{1025} * 1}{P[10\ heads]} = \frac{\frac{1}{1025}}{P[10\ heads]}$$

$$P[biased\ |10\ heads] = P[fair\ |10\ heads] = \frac{1}{2}$$

(a)

$$Expected = \frac{1}{2} * \frac{1}{2} * 100 + \frac{1}{2} * 100 = 75$$

(b)

$$Expected = \frac{1}{\frac{1}{2}} * \frac{1}{2} + 1 * \frac{1}{2} = 1.5$$

19.54

Assume chances to have a boy is P, have a girl is 1 – P.

$$Expected = \left(1 + \frac{1}{p}\right) * p + \left(1 + \frac{2}{p}\right) * (1 - p) = \frac{2}{p}$$

(a)

Possibilities for females: 2/3

Possibilities for males: 1/3

$$Expected = \frac{2}{\frac{1}{3}} = 6$$

(b)

Possibilities for females: 1/2

Possibilities for males: 1/2

$$Expected = \frac{2}{\frac{1}{2}} = 4$$

(c)

Possibilities for females: 1/3

Possibilities for males: 2/3

$$Expected = \frac{2}{\frac{2}{3}} = 3$$

20.11

(a)

$$\frac{1}{10!}$$

(b)

If a person sleeps in the wrong bunk, there must be another person sleep in the wrong bunk. There is no way that only one person sleeps in the wrong bunk

Answer: 0

(c)

$$\frac{\binom{10}{2}}{10!} = \frac{45}{10!}$$

(d)

No matter the chance they sleep in their own bunk, we would always expect 1 person sleep in his own bunk.

Answer: 1