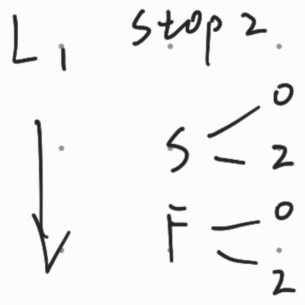
Q2.

$$Var[L_1 \cdot L_2] = E(L_1^2 L_2^2) - (E(L_1 L_2))^2$$



L_1	L_2	prob	$L_1 \cdot L_2$	$L_1^2 \cdot L_2^2$
0	2	(0.6)(0.4)	0	0
2	4	(0.6)(0.6)	8	64
0	0	(0.4)(0.4)	0	0
2	2	(0.4)(0.6)	4	16

$$E(L_1 L_2) = 0 + 8(0.6 \cdot 0.6) + 0 + 4(0.4 \cdot 0.6)$$
$$= 2.88 + 0.96 = 3.84$$

$$E(L_1^2 L_2^2) = 0 + 64(0.6 \cdot 0.6) + 0 + 16(0.4 \cdot 0.6)$$
$$= 23.04 + 3.84 = 26.88$$

$$\therefore Var(L_1 \cdot L_2) = 26.88 - (3.84)^2 = 12.1344$$

Q3.

$P(\text{heads}) = \frac{9}{100}$ $\qquad r=3, s=6$

$P(\text{Tails}) = \frac{91}{100}$

min. stop :

		prob
HHH	3	$(\frac{9}{100})^3$
THHH	4	$(\frac{9}{100})^3 \cdot (\frac{91}{100})$
TTHHH	5	$(\frac{9}{100})^3 \cdot (\frac{91}{100})^2$
HTHHH	5	$(\frac{9}{100})^4 \cdot (\frac{91}{100})$
	6	$(1-(\frac{9}{100})^3 - ((\frac{9}{100})^3 \cdot (\frac{91}{100})) - ((\frac{9}{100})^3 \cdot (\frac{91}{100})^2) - ((\frac{9}{100})^4 \cdot (\frac{91}{100}))$

$$\therefore E(X) = 3 \cdot (\frac{9}{100})^3 + 4 \cdot ((\frac{9}{100})^3 \cdot (\frac{91}{100})) + 5((\frac{9}{100})^4 \cdot (\frac{91}{100})) + 5((\frac{9}{100})^4 \cdot (\frac{91}{100})) + 6(1-(\frac{9}{100})^3 - ((\frac{9}{100})^3 \cdot (\frac{91}{100})) - ((\frac{9}{100})^3 \cdot (\frac{91}{100})^2) - ((\frac{9}{100})^4 \cdot (\frac{91}{100}))$$

E(X) is the average numbe of toses you will make until game is stopped.

Q4.1

$y = 9$

$[10, 29]$

$x \sim \text{Unif}(10, 29)$

a.

$$P(X < 8) = \int_0^8 f_X(x)\,dx$$
$$= \int_0^8 \frac{1}{29-10}\,dx = \frac{1}{19}\, x \Big|_0^8$$
$$= \frac{8}{19}$$

b.

$$P(X > 29) = 0$$

c.

$$P(15 < X < 22) = \int_{15}^{22} \frac{1}{29-10}\,dx = \frac{1}{19}\, x \Big|_{15}^{22}$$
$$= \frac{7}{19}$$

d.

$$E[9 \cdot X] = 10 \cdot \frac{1}{19} + 11 \cdot \frac{1}{19} + 12 \cdot \frac{1}{19} + \cdots + 29 \cdot \frac{1}{19}$$