One piece of fruit is chosen randomly from a box containing 3 apples, 4 bananas, and 5 cherries. Each piece of fruit is equally likely. The random variables X and Y are defined as follows:

$$X(apple) = 0 \qquad Y(apple) = 1$$
$$X(banana) = 1 \qquad Y(banana) = 1$$
$$X(cherry) = -1 \qquad Y(cherry) = 0$$

add $P(a) + P(b)$

What is the value of the CDF difference $F_X(\frac{\sqrt{2}}{2}) - F_Y(1)$?

$|S| = 3+4+5 = 12$

(a) $-1/3$
(b) $1/3$
(c) $1/4$
(d) $-1/4$
(e) $5/12$
(f) $-5/12$
(g) 0
(h) 1
(i) -1
(j) $7/12$
(k) $3/4$
(l) $2/3$
(m) None of these

$P(X=0) = \frac{3}{12}$ $\quad P(Y=1) = \frac{7}{12}$

$P(X=1) = \frac{4}{12}$ $\quad P(Y=0) = \frac{5}{12}$

$P(X=-1) = \frac{5}{12}$

$F_X(u) = P(X \le u)$

$F_X(\frac{\sqrt{2}}{2}) = P(X \le \frac{\sqrt{2}}{2})$ $\quad \frac{\sqrt{2}}{2} \approx .7$

$= P(X=0) + P(X=-1)$

$= \frac{8}{12} = \frac{2}{3}$

$F_Y(1) = P(Y \le 1)$

$= P(Y=1) + P(Y=0)$

$= 1$

$\rightarrow \quad \frac{2}{3} - 1 = \frac{-1}{3}$

One piece of fruit is chosen randomly from a box containing 3 apples, 4 bananas, and 5 cherries. Each piece of fruit is equally likely. The random variables X and Y are defined as follows:

$X(apple) = 0$	$Y(apple) = 1$
$X(banana) = 1$	$Y(banana) = 1$
$X(cherry) = -1$	$Y(cherry) = 0$

What is the probability that $(X^2 - 2XY)^2$ is positive?

$P(X=0) = \frac{3}{12}$ $\quad P(Y=1) = \frac{7}{12}$

$P(X=1) = \frac{4}{12}$ $\quad P(Y=0) = \frac{5}{12}$

$P(X=-1) = \frac{5}{12}$

(a) 3/4
(b) 1/4
(c) 1/3
(d) 2/3
(e) 5/12
(f) 7/12
(g) 0
(h) 1
(i) 1/2
(j) 1/12
(k) 3/8
(l) None of these

$F_X(u) = P(X \leq u)$

$(X^2 - 2XY)^2 = (X(X-2Y))^2 > 0$

$P((X(X-2Y))^2 > 0) = P(X(X-2Y) \neq 0)$

→ run for each outcome

a $X=0, Y=1$: $0(0-2\cdot1) = 0$ ✗

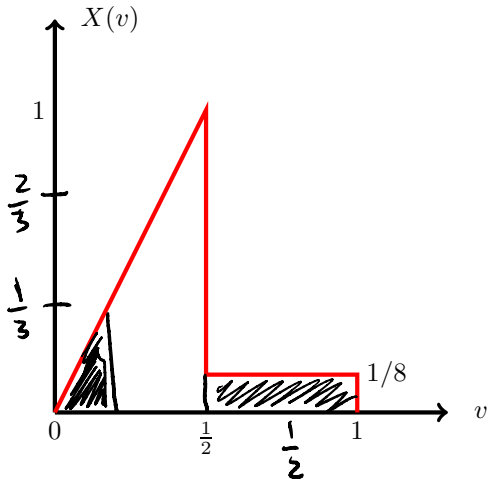
b $X=1, Y=1$: $1(1-2\cdot1) = -1$ ✓

c $X=-1, Y=0$: $1(1-2\cdot0) = 1$ ✓

$P(X(X-2Y) \neq 0) = P(b) + P(c)$

$= \frac{4}{12} + \frac{5}{12} = \frac{9}{12} = \frac{3}{4}$

An experiment has sample space $S = [0, 1]$ and $P([a, b]) = b - a$ whenever $0 \le a \le b \le 1$. A random variable X on S is defined as shown in the graph below. What is the CDF value $F_X(1/3)$?



$F_x(u) = P(X \le u)$

$P[a,b] = b - a \rightarrow$ length on v axis $= P$

(a) 2/3

(b) 1/6

(c) 1/3

(d) 1/2

(e) 7/24

(f) 11/24

(g) 1/8

(h) 1/4

(i) 3/8

(j) 5/6

(k) 5/24

(l) None of these

$x(v) = 2v \quad , v < \frac{1}{2}$

$2v \le \frac{1}{3}$

$\rightarrow v \le \frac{1}{6}$

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