Quiz tomorrow Section 2
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Integral of the Day

INVERSE TRIG
ARCSINE

$$\int \frac{dx}{\sqrt{9-16x^2}}$$

$$= \int \frac{dx}{\sqrt{3^2-(4x)^2}}$$

$$u = 4x$$
$$du = 4dx$$
$$\frac{du}{4} = dx$$

$$= \frac{1}{4} \int \frac{du}{\sqrt{3^2-u^2}}$$

Formula Sheet

$$\int \frac{1}{\sqrt{a^2-x^2}} dx = \sin^{-1} \frac{x}{a} + c$$

$$\int \frac{du}{\sqrt{a^2-u^2}} = \sin^{-1} \frac{u}{a} + C$$

$$a = 3$$

$$= \frac{1}{4} \sin^{-1} \frac{u}{3} + C$$

$$= \frac{1}{4} \sin^{-1} \frac{4x}{3} + C$$

Section 3. Probability
Recall 3 Rules   (Week 10 Friday)

Ex 8. A password consists of 7 digits, each chosen from 0,1,2, $\cdots$, 9. Find:
a) the total number of possible passwords
b) the number of passwords that end with 3
c) the number of passwords that don't end with 3
d) the probability that a password starts with 4

e) the probability that a password doesn't start with 4
f) the probability that a password contains a least one 4
g) the probability that a password starts with 29 or ends with 1

Recall

a) $n(s) = 10 \times 10 \times \cdots \times 10 = 10^7$

d) $P(\text{starts } 4) = 0.1$

$\boxed{P(\text{not } A) = 1 - P(A)}$

e) $P(\text{doesn't start with 4}) = 1 - P(\text{start } 4)$
$= 1 - 0.1$
$= 0.9$

f) $n(\text{passwords with at least one 4})$

$= n(s) - n(\text{passwords with no 4})$

$= 10^7 - \boxed{9} \times \boxed{9} \times \boxed{9} \times \square\,\square\,\square \times \boxed{9}$

$\underbrace{}_{0-3 \text{ or } 5-9}$

$= 10^7 - 9^7$

$P(\text{password has at least one 4}) = \dfrac{10^7 - 9^7}{10^7}$

≈ 0.52

g) $n(\text{start 29 or end 1}) = n(\text{start 29}) + n(\text{end 1})$
$\qquad\qquad\qquad\qquad\qquad - n(\text{start 29 and end 1})$

$n(A \text{ or } B) = n(A) + n(B) - n(A \text{ and } B)$

$= 10^5 + 10^6 - 10^4$

$\text{Probability} = \dfrac{(10^5 + 10^6 - 10^4)}{10^7} = 0.109$

Visualization:

starts 29:   2 9 _ _ _ _ _

n(start 29): $1 \times 1 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^5$

ends 1:   _ _ _ _ _ _ 1

n(end 1) = 10^6

4. Discrete Random Variables

Discrete random variable: function that assigns a # to each outcome of an experiment

Notation: X for a discrete random variable

x for a specific value of X

The probability distribution of X :

x	$P(x)$
#	
#	
#	

Ex 1. Let X be the number of heads observed in 3 coin tosses. Find the probability distribution of X.

Want

x	$P(x)$
⋮	⋮

1

x	Description	# Outcomes	$P(x)$
0	TTT	1	$\frac{1}{8}$
1	HTT, THT, TTH	3	$\frac{3}{8}$
2	HHT, HTH, THH	3	$\frac{3}{8}$
3	HHH	1	$\frac{1}{8}$

total = 8

More Concise :

x	$P(x)$
0	0.125
1	0.375
2	0.375
3	0.125