Solution Key - Theta Probability Test

(1) R W B

$\frac{10}{24} \cdot \frac{8}{23} \cdot \frac{6}{22} = \frac{10}{253}$

RBW, BRW, BWR, WRB, WBR

all $\frac{10}{253}$ $\quad 50$ $\quad \frac{60}{253}$

D

(2) $\frac{C(5,3)}{2^5} = \frac{10}{32} = \frac{5}{16}$ **A**

(3) Worst case: you draw 8 blue, 6 black, 4 green & 1 white — next one must be white

50 $\quad$ 20 **D**

(4)

Round	I	II	III
A	$\frac{1}{2}$	$\frac{1}{16}$	$\frac{1}{128}$
B	$\frac{1}{4}$	$\frac{1}{32}$	$\frac{1}{256}$
C	$\frac{1}{8}$	$\frac{1}{64}$	$\frac{1}{512}$

infinite geometric sequence

in each round Beth's chance of winning is $\frac{2}{7}$

B

(5) 24 numbers. Those ending in 24(2), 64(2), 72(2) and 76(2) are divis. by 4

$\frac{8}{24}$ **C**

40

(6) 4 13 22 31 103 112 121 130 202 211 220 301 310 400

4/15 AM (B)

(7) $\frac{P(3,3)}{3^3} = \frac{6}{27} = \frac{2}{9}$ (need one of each) (C)

(8)
HHH
HHT
HTH
HTT
THH
THT
TTH
TTT

1/4 (C)

(9)

OUTCOME	ways
2	1
3	2
4	3
5	4
6	5
7	6
8	5
9	4
10	3
11	2
12	1

$\frac{15}{36} = \frac{5}{12}$ (A)

(10)

OUTCOME	ways
3	1
4	3
5	6
6	10
7	15
8	21
9	25
10	27
11	27
12	25
13	21
14	15
15	10
16	6
17	3
18	1

$\frac{27}{216} = \frac{1}{8}$ (A)

(11) ways to win

VV $\frac{5}{26} \cdot \frac{4}{25} = \frac{2}{65} = \frac{8}{260}$

VCV $\frac{5}{26} \cdot \frac{21}{25} \cdot \frac{4}{24} = \frac{7}{260}$

CVV

$\frac{7}{260}$

$= \frac{22}{260}$

$= \frac{11}{130}$ (D)

2

(12) Binomial expansion

$$\left(\frac{1}{6}+\frac{5}{6}\right)^6 = 1\left(\frac{1}{6}\right)^6 + 6\left(\frac{1}{6}\right)^5\left(\frac{5}{6}\right) + 15\left(\frac{1}{6}\right)^4\left(\frac{5}{6}\right)^2 + 20\left(\frac{1}{6}\right)^3\left(\frac{5}{6}\right)^3 + 15\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^4 + 6\left(\frac{1}{6}\right)\left(\frac{5}{6}\right)^5 + 1\left(\frac{5}{6}\right)^6$$

$$= 1 + 30 + 375 + 2500 + 9375 + 18750 + 15625$$

$$46656$$

C $\quad \frac{12281}{46656}$

(13) $9\pi - 4\pi = 5\pi$ $\quad \frac{5\pi}{9\pi} = \frac{5}{9}$ D

(14) Jessica will get more of either heads or tails but not both. Since either is equally likely.

$P = \frac{1}{2}$ B

(15) Start 2Q 2N 3P $= \frac{63}{7} = 9$

Then 3Q 2N 3P $\quad \frac{88}{8} = 11$

$\frac{2}{7}$ C

(16) Cubes painted on

0 sides	1
1 side	6
2 sides	12
3 sides	8

} must be one of these

ON The 6 with one side painted there is a $\frac{1}{6}$ prob that the painted side will be unseen

$$\therefore \frac{1 + \frac{1}{6}(6)}{27} = \frac{2}{27}$$

(B)

17) $\frac{7}{15} \cdot \frac{12}{25} = \frac{84}{375} = \frac{28}{125}$

B

18)

$1 - P(\text{not mult of } 3)$

$P(\text{not mult of } 3) = \frac{10}{15} \cdot \frac{17}{25} = \frac{170}{375}$

$1 - \frac{170}{375} = \frac{205}{375} = \frac{41}{75}$

B

19) 375 sums

First #	# of sums > 20
1	6
2	7
3	8
4	9
5	10
6	11
7	12
8	13
9	14
10	15
11	16
12	17
13	18
14	19
15	20
	195

$\frac{195}{375} = \frac{39}{75} = \frac{13}{25}$

A

(20) IN 4 yrs 1461 days

$P(\text{not on Feb 29}) = \frac{1460}{1461}$

$\left(\frac{1460}{1461}\right)^x = .5$

$x \log\left(\frac{1460}{1461}\right) = \log .5$

$x = \frac{\log .5}{\log\left(\frac{1460}{1461}\right)} = 1012.34$

1013

A

(21) ~~C~~ $\frac{P(4,1)\,C(13,5)}{C(52,5)} =$ D

or $\frac{\cancel{52}}{\cancel{50}} \cdot \frac{\cancel{10}}{\cancel{51}} \cdot \frac{11}{\cancel{50}} \cdot \frac{\cancel{10}}{49} \cdot \frac{\overset{3}{\cancel{9}}}{\cancel{48}} = \frac{33}{16660}$

17 5 4

(22)

THHHH	1/32
HTHHH	1/32
HHTHH	1/32
HHHTH	1/32

$\frac{1}{8}$ ← same for 4 T + $\frac{1}{8} = \frac{1}{4}$ B

If HHHHT game would be over in 4 flips

(23) $13N\ 14P = 79¢$ $\frac{14}{27}$ **C**

(24) $+2a - b = c$

If a =	Successes b	c
-2	0	-4
-2	-2	-2
-1	0	-2
-1	-2	~~0~~ 0
-1	2	~~-4~~ -4
0	-2	+2
0	0	0
0	2	-2
1	2	0
1	0	2
1	-2	4
2	0	4
2	2	2

$\frac{13}{125}$

C

(25)

14	38	68
1	45	78
18	46	89
24	47	
26	48-49	
28	58	
311		

$\frac{16}{36} = \frac{4}{9}$

C(9,2)

C

(26)

H	T	U
2, 4, 6, 8	1, 3, 5, 7, 9	8 poss (10 - The 2 selected for H & T)

$4 \cdot 5 \cdot 8$

$\frac{160}{900} = \frac{8}{45}$ = **D**