Dr. ZABDAWI MATH 1001/Exam III 4/2/12

Name Solution Key

This is a take home exam, and no assisstance can be offered by the SSC or any faculty on campus. The take home exam is meant to be your work at home.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

1) At a lumber company, shelves are sold in 5 types of wood, 4 different widths and 3 different lengths. How many different types of shelves could be ordered? 1) D

Total No. of types $= 5 \times 4 \times 3 = 60$

A) 12 B) 27 C) 100 D) 60

Find the indicated probability.

2) A die with 6 sides is rolled. What is the probability of rolling a number less than 5? 2) B

$P(x<5) = 1 - P(x \geq 5)$

$= 1 - \left[\frac{1}{6} + \frac{1}{6}\right] = 1 - \frac{1}{3} = \frac{2}{3}$

A) $\frac{1}{6}$ B) $\frac{2}{3}$ C) $\frac{5}{6}$ D) 4

3) If a person is randomly selected, find the probability that his or her birthday is in May. Ignore leap years. 3) B

$P(\text{May}) = \frac{31}{365} = .085$

A) $\frac{1}{12}$ B) $\frac{31}{365}$ C) $\frac{1}{31}$ D) $\frac{1}{365}$

4) What is the probability of not rolling a number larger than 4 with a fair die? 4) A

A) $\frac{2}{3}$ B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{5}{6}$

$P(x>4) = P(5) + P(6) = \frac{1}{6} + \frac{1}{6}$

$= \frac{1}{3}$

Not rolling a number $>4 = 1 - \frac{1}{3} = \frac{2}{3}$

$\Rightarrow P(\overline{>4}) = \frac{2}{3}$

Make a probability distribution for the given set of events.

5) When four fair coins are tossed, sixteen equally likely outcomes are possible as shown below: 5) D

HHHH	HHHT	HHTH	HHTT
HTHH	HTHT	HTTH	HTTT
THHH	THHT	THTH	THTT
TTHH	TTHT	TTTH	TTTT

Make a probability distribution for the number of tails when four fair coins are tossed.

A)

Result	Probability
0 T	1/16
1 T	1/8
2 T	3/8
3 T	1/8
4 T	1/16

B)

Result	Probability
1 T	1/4
2 T	7/16
3 T	1/4
4 T	1/16

C)

Result	Probability
0 T	1/16
1 T	3/16
2 T	1/2
3 T	3/16
4 T	1/16

D)

Result	Probability
0 T	1/16
1 T	1/4
2 T	3/8
3 T	1/4
4 T	1/16

Solve the problem.

6) Find the odds against drawing a heart when a card is drawn at random from a normal deck of 52 playing cards. 6) B

$P(\text{Heart}) = \frac{1}{4} \Rightarrow$ Odds against drawing a heart are 3:1

A) 1 to 3 (B) 3 to 1 C) 4 to 1 D) 1 to 4

Provide an appropriate response.

7) B growth occurs when a quantity grows by the same relative amount in each unit of time. 7) B

A) Static (B) Exponential

C) Linear D) None of the above

8) The initial population of a town is 18,043 and it grows with a doubling time of 12 years. What will the population be in 6 years? 8) B

$P(t) = P_0 \cdot 2^{t/T_D}$, t = Relevant Time; $T_D \approx \frac{70}{\%}$, but given $T_D = 12$ years; $P(6) = 18043 \times 2^{6/12} = 25516.65 \approx 25{,}517$ people

A) 108,258 people (B) 25,517 people C) 216,516 people D) 18,047 people

9) Oil consumption is increasing at a rate of 1.7% per year. By what factor will oil consumption increase in 2 years? Use the approximate doubling time formula (rule of 70). 9) C

A) 1.01 B) 6.8 (C) 1.03 D) 1.73

$T_D \approx \frac{70}{1.7} = 41.176$ years; $C(t) = C_0 \cdot 2^{t/41.176}$ years, t = Relevant Time

$\frac{C(2)}{C_0} = 2^{2/41.176} = 1.03 \Rightarrow 3\%$ Increase

10) The half-life of a radioactive substance is 44 years. If you start with some amount of this substance, what fraction will remain in 109 years? 10) C

$A(t) = A_0 \left(\frac{1}{2}\right)^{t/44}$; t = Reference Time

$\frac{A(109)}{A_0} = \left(\frac{1}{2}\right)^{\left(\frac{109}{44}\right)} = 0.18$

A) 0.03 B) 5.57 C) 0.18 D) 0.01

Solve.

11) Using the chessboard parable, find the total number of grains when all squares up to and including 19 are filled? 11) C

Total No. of grains up to and including square 19

$= 2^{19} - 1 = 524287$ grains

A) 262,144 grains B) 36 grains C) 524,287 grains D) 131,072 grains

12) Use the magic penny parable to determine how much money you would have after 8 days. 12) A

$\$(t) = .01 \times 2^t$; t = Day No. = 0, 1, 2, ...

$\$(8) = .01 \times 2^8 = \$2.56$

A) $2.56 B) $1.28 C) $655.36 D) $5.12

Provide an appropriate response.

13) Inflation is causing prices to rise at a rate of 5% per year. What will the price be in 3 years if the item costs $100 today? 13) A

$P(t) = P_0 \cdot 2^{t/TD}$

$TD \approx \frac{70}{5} = 14$

$P(t) = P_0 \cdot 2^{t/14}$

$P(5) = 100 \times 2^{3/14} \cong 116.013$

$P(t) = P_0(1+.05)^3$

$P(3) = 100 \times 1.05^3 = \$115.76$

A) $115.76 B) $100.15 C) $100.05 D) $100.17

14) A nation of 100 million people is growing at a rate of 5% per year. Use the exact double time formula to determine what the population will be in 26 years. 14) A

$TD = \frac{\ln 2}{\ln(1+r)} = \frac{\ln 2}{\ln(1+.05)} = 14.207$ yrs.

A) 356 million B) 246 million C) 189 million D) 102 million

$P(t) = 100 \times 2^{t/14.207}$

t = Reference Time

$\Rightarrow P(26) = 100 \times 2^{(26/14.207)}$

$= 355.56 \approx 356$ million.

15) Real populations sometimes increase beyond their environment's carrying capacity in a relatively short period of time. What is the name of this phenomenon? 15) B

A) Logistic growth
B) Overshoot
C) Annual growth rate
D) Collapse

16) The following table gives the birth and death rates for four countries in three different years: 16) D

	Birth rate (per 100)			Death rate (per 100)		
Town	1980	1990	2000	1980	1990	2000
Simpleton	1.9	1.5	0.9	1.2	1.2	0.8
Normalton	2.8	2.4	2.1	0.7	0.6	0.5
Ruralton	1.3	1.2	1.2	1.1	1.0	0.9
Littleton	1.4	1.6	1.5	0.9	0.8	0.7

$N.G.R = B.R - D.R$
$= 1.3 - 1.1 = +.2$ per 100

Find Ruralton's net growth rate due to births and deaths in 1980.

A) 0.6 per 100
B) 0.2 per 100
C) 0.9 per 100
D) 0.4 per 100

17) Use the 1960s peak annual growth rate of 0.5% and population of 6 million to predict the current growth rate with a logistic model. Assume a current country population of 16 million. Assume the carrying capacity is 29 million. Hint: Use the logistic growth eq. with r=.5%. 17) A

$GR = r\left(1 - \frac{6}{16}\right)$
$0.5 = r\left(1 - \frac{6}{29}\right)$
$r = \frac{0.5}{(1 - 6/29)}$
$r = .63$

New Current Growth Rate $= r\left(1 - \frac{\text{Pop.}}{\text{Carrying Capacity}}\right)$
$= .63\left(1 - \frac{16}{29}\right) = .282\%$

A) 0.28%
B) 0.42%
C) 0.91%
D) 0.50%

Use the decibel scale to answer the question.

18) How much louder (more intense) is a 74-dB sound than a 20-dB sound? 18) B

$\frac{I_{74dB}}{I_{0dB}} = 10^{\frac{74}{10}} = 10^{7.4}$
$\frac{I_{20dB}}{I_{0dB}} = 10^{\frac{20}{10}} = 10^{2}$

$\frac{I_{74dB}}{I_{20dB}} = \frac{I_{74dB}}{I_{0dB}} \div \frac{I_{20dB}}{I_{0dB}} = \frac{10^{7.4}}{10^{2}} = 10^{5.4} = 255188.6$
≈ 255189 times as loud

A) 3.7 times as loud
B) 251,189 times as loud
C) 6.309573445e+12 times as loud
D) 35,389,632 times as loud

19) How does the intensity of sound from a concert speaker at a distance of 40 meters compare to the intensity at a distance of 80 meters? 19) D

A) Factor of 16 weaker at 80 m.
B) Factor of 2 weaker at 80 m.
C) Factor of 20 weaker at 80 m.
D) Factor of 4 weaker at 80 m.

$I_{40\text{ meters}} \propto \frac{1}{40^2}$
$I_{80\text{ meters}} \propto \frac{1}{80^2}$

$\Rightarrow \frac{I_{40m}}{I_{80m}} \propto \frac{1}{40^2} \propto \frac{80^2}{1} = \left(\frac{80}{40}\right)^2 = 4$

Provide an appropriate response.

20) What is comprised of the values of the dependent variable? 20) A

(A) Range
B) Domain
C) Model
D) Periodic function

21) True or False? If you create a graph showing how heart rate depends on running speed, the range should be heart rates from 60 to 180. 21) A

(A) True
B) False

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Plot and label the given points.

22) (6, 6), (−1, 3) 22) A