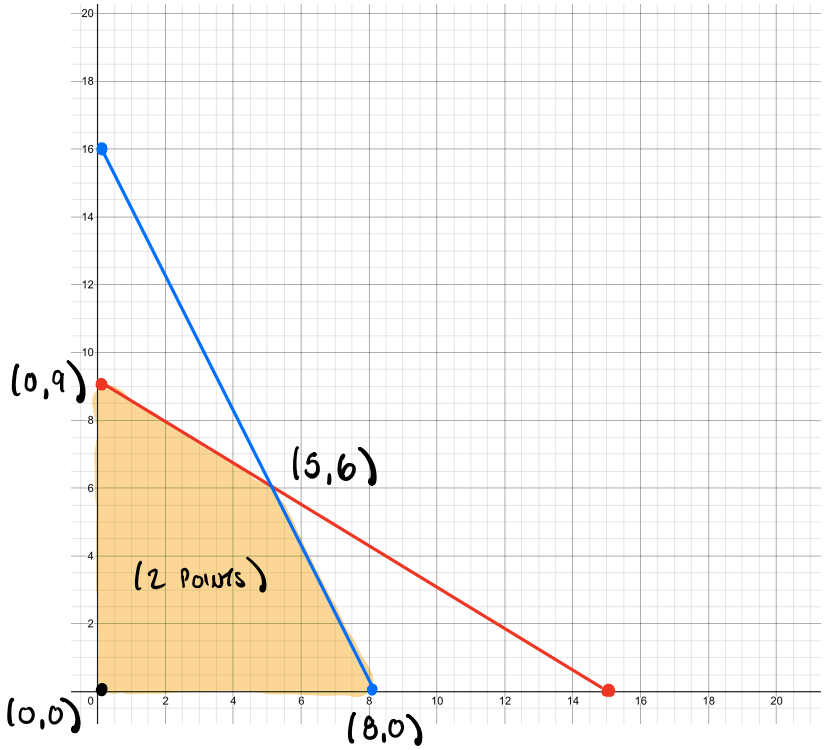
Written Homework

Name: _____

Put your solutions inside the envelope on my office door (JMH 418) anytime before 1pm Tuesday 12/13. At that time, solutions will be posted to https://johnadamski.com.

$$I = Prt \qquad A = P(1+rt)$$
$$A = P(1+i)^n \qquad i = \frac{r}{m}$$
$$FV = PMT\frac{(1+i)^n - 1}{i} \qquad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

1. A pottery hobbyist has decided to open a small online store to sell handmade ceramic mugs and bowls. Each mug requires 3 ounces of clay, takes 2 hours to make, and sells for \$22. Each bowl requires 5 ounces of clay, takes 1 hour to make, and sells for \$18. If she can only use 45 ounces of clay each week, and can only devote 16 hours per week to pottery, how many mugs and how many bowls should she make each week to maximize her sales?



		OZ CLAY	HOURS	SALES
x	MUGS	3	2	22
y	BOWLS	5	1	18

CONSTRAINTS: $3x + 5y \leq 45$

$2x + y \leq 16$

$x \geq 0, \; y \geq 0$

CORNER POINTS (3 POINTS)

MAXIMIZE OBJECTIVE FUNCTION $S = 22x + 18y$

x	y	S
0	0	0
0	9	162
5	6	218
8	0	176

MAX SALES \$218 WHEN SHE MAKES 5 MUGS & 6 BOWLS.

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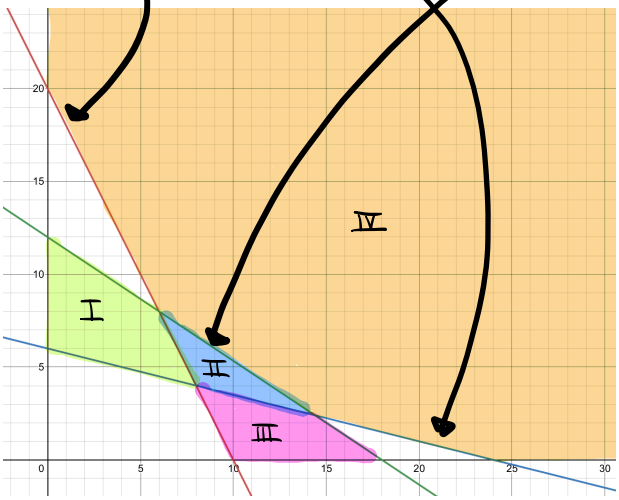
2. The graphs of the following three equations are shown below.

$8x + 4y = 80$ $3x + 12y = 72$ $2x + 3y = 36$

Assume that all of the shaded regions in the figure include their boundary lines.



(a) Which region (I, II, III, or IV) is the solution region to the following system?

$$\begin{cases} 8x + 4y & \geq & 80 \\ 3x + 12y & \geq & 72 \\ 2x + 3y & \leq & 36 \\ x & \geq & 0 \\ y & \geq & 0 \end{cases}$$

II

(b) Write a system of inequalities such that the solution region is the region labelled I.

$$\begin{cases} 8x + 4y \leq 80 \\ 3x + 12y \geq 72 \\ 2x + 3y \leq 36 \\ x \geq 0 \end{cases}$$

($y \geq 0$ OPTIONAL)

(c) Why is every linear objective function of x and y (e.g. $z = ax + by$) guarenteed to attain both a maximum and minimum value over the shaded regions labelled I, II, and III, but not IV?

REGIONS I, II, AND III ARE BOUNDED.

REGION IV IS UNBOUNDED.

3. Suppose a one-time investment earns an annual interest rate of 4.38% compounded monthly, and the value grows to \$10,000 in 3.5 years. Find the size of the investment.

$A = P(1+i)^n \Rightarrow P = \frac{A}{(1+i)^n} = \frac{10{,}000}{1.00365^{42}} \approx \$8{,}581.12$

Note: $i = .0438/12 = .00365$

$n = 3.5 \times 12 = 42$

4. If \$600 is borrowed from a lender that charges simple interest and the total amount owed 3 months later is \$681, what annual (simple) interest rate did the lender charge?

$A = P(1+rt) \Rightarrow \frac{A}{P} = 1+rt \Rightarrow \frac{A}{P} - 1 = rt$

$\Rightarrow r = \frac{\frac{A}{P} - 1}{t} = \frac{\frac{681}{600} - 1}{3/12} = .54$ or 54%

5. (a) Calculate the monthly payment for a 4 year loan of \$20,000 that charges an annual interest rate of 5.76% compounded monthly.

$PV = PMT\,\frac{1-(1+i)^{-n}}{i} \Rightarrow PMT = \frac{PV\,i}{1-(1+i)^{-n}}$, $i = \frac{.0574}{12} = .0048$

$n = 4 \times 12 = 48$

$PMT = \frac{20{,}000\,(.0048)}{1-(1.0048)^{-48}} \approx \$467.50$

(b) How much total interest is charged?

$48 \times 467.50 - 20{,}000 = \$2{,}440$

6. How long does it take an investment to double if it earns an annual interest rate of 6.84% compounded quarterly.

$$A = P(1+i)^n \Rightarrow \frac{A}{P} = (1+i)^n \Rightarrow \text{Log}\left(\frac{A}{P}\right) = n\,\text{Log}(1+i)$$

$$\Rightarrow n = \frac{\text{Log}\left(\frac{A}{P}\right)}{\text{Log}(1+i)} = \boxed{\frac{\text{Log } 2}{\text{Log}(1.0171)}} \approx 40.8 \quad \text{ROUND UP}$$

NOTE: INVEST HAS DOUBLED WHEN $\frac{A}{P} = 2$

$$i = \frac{.0684}{4} = .0171$$

$\boxed{41 \text{ QUARTERS} \quad (10.25 \text{ YEARS OR EQUIVALENT})}$

7. Suppose Shelby invests \$250 at the end of each month into an account that earns an annual interest rate of 7.44% compounded monthly. What is her account balance after 35 years, and how much of this is interest?

$$FV = PMT\,\frac{(1+i)^n - 1}{i} = 250\,\frac{1.0062^{420} - 1}{.0062}$$

$$i = \frac{.0744}{12} = .0062 \approx \boxed{\$500,381.66}$$

$$n = 35 \times 12 = 420$$

$$\text{INTEREST} = 500,381.66 - 420(250) = \boxed{\$395,381.66}$$

8. Consider the following sets.

$$A = \{g, a, r, l, i, c\}$$
$$B = \{g, o, b, l, i, n\}$$
$$C = \{A, B\}$$

(a) List the elements in the set $A \cup B$.

$A \cup B = \{g, a, r, l, i, c, o, b, n\}$

(b) List the elements in the set $A \cap B$.

$A \cap B = \{g, l, i\}$

(c) How many distinct subsets of A exist?

$2^6 = 64$

(d) True or false:

i. $g \in A$ T
ii. $g \subset B$ F
iii. $\{g, a, r\} \subset A$ T
iv. $\{g, a, r\} \subset C$ F
v. $B \in C$ T
vi. $A \in A$ F
vii. $B \subset B$ T
viii. $\{A\} \subset C$ T

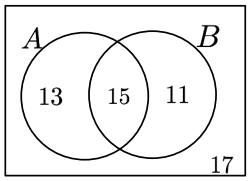
$\{g\} \subset B$

$\{g, a, r\} \subset A \in C$

$\{g, a, r\} \subset A \cup B \neq C$

$A \subset A$

9. Refer to the following Venn diagram.



(a) What is $n(A)$? $13 + 15 = 28$

(b) What is $n(B')$? $13 + 17 = 30$

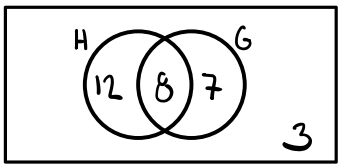
(c) What is $n(A \cup B)$? $13 + 15 + 11 = 39$

(d) What is $n(A \cap B')$? 13

10. Evaluate ${}_7C_3$ by hand and simplify your answer.

$$\frac{7!}{3!(7-3)!} = \frac{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 7 \cdot 5 = \boxed{35}$$

11. Suppose there are 30 children playing on a playground. Twenty children are wearing a hat, 15 children are wearing gloves, and 8 children are wearing both a hat and gloves. How many children are wearing neither a hat nor gloves?



$$n(H \cup G) = n(H) + n(G) - n(H \cap G)$$
$$= 20 + 15 - 8 = 27$$
$$\Rightarrow n(H' \cap G') = n((H \cup G)') = 30 - n(H \cup G)$$
$$= 30 - 27 = \boxed{3}$$

12. Suppose you run a small business selling socks online. When a customer places an order, they must select a style (men's or women's), a size (small, medium, or large), a length (ankle or calf), and a color (white, grey, navy, or black). How many different types of socks must you keep in your warehouse in order to be able to fulfill any single order?

MULTIPLICATION PRINCIPLE

$$\underset{\#\text{ STYLES}}{2} \times \underset{\#\text{ SIZES}}{3} \times \underset{\#\text{ LENGTHS}}{2} \times \underset{\#\text{ COLORS}}{4} = \boxed{48}$$

13. A school drama club with 24 members is going to stage a short play.

(a) Suppose they need to pick from among themselves one person to be the director, a second person to be the choreographer, and a third person to be the musical director. How many different ways can this be done?

$$\underset{\substack{\#\text{ WAYS TO CHOOSE} \\ 1\text{ DIRECTOR}}}{24} \times \underset{\substack{\#\text{ WAYS TO CHOOSE} \\ 1\text{ CHOREOG.}}}{23} \times \underset{\substack{\#\text{ WAYS TO CHOOSE} \\ 1\text{ MUS. DIR.}}}{22} = {}_{24}P_3 = 12,144$$

(ALL 3 ANSWERS ARE ACCEPTABLE.)

(b) Suppose they need to pick from among themselves a pair of people (two) to be co-directors, a second pair of peeople to be co-choreographers, and a third pair of people to be musical co-directors. How many different ways can this be done?

$$\underset{\substack{\#\text{ WAYS TO CHOOSE} \\ 2\text{ DIRECTORS}}}{{}_{24}C_2} \times \underset{\substack{\#\text{ WAYS TO CHOOSE} \\ 2\text{ CHOREOG.'S}}}{{}_{22}C_2} \times \underset{\substack{\#\text{ WAYS TO CHOOSE} \\ 2\text{ MUS. DIR.'S}}}{{}_{20}C_2} = 12,113,640$$

(BOTH ANSWERS ARE ACCEPTABLE.)

14. Three marbles are randomly selected from a jar containing 8 red marbles and 3 blue marbles without replacement. Is it more likely that at least 1 blue marble is selected, or that no blue marble is selected?

LET OB = 0 BLUE MARBLES & 3 RED MARBLES SELECTED.

NOTE THAT OB' = AT LEAST 1 BLUE MARBLE IS SELECTED.

$$P(OB) = \frac{n(OB)}{n(S)} = \frac{{}_8C_3}{{}_{11}C_3} = \frac{56}{165}$$

$$P(OB') = 1 - P(OB) = 1 - \frac{56}{165} = \frac{109}{165}$$

$\therefore$ $P(OB') > P(OB)$, i.e. MORE LIKELY TO SELECT AT LEAST 1 BLUE MARBLE THAN NO BLUE MARBLES

15. Four people are asked to randomly pick a number 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10. Find the probability that at least 2 people pick the same number. *Hint:* $P(A) = 1 - P(A')$.

LET A = AT LEAST 2 PEOPLE PICK THE SAME NUMBER

A' = EVERYONE PICKS A DIFFERENT NUMBER

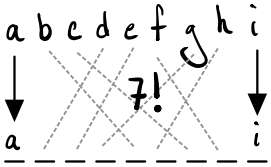
$$P(A') = \frac{n(A')}{n(S)} = \frac{{}_{10}P_4}{10^4} = \frac{5040}{10{,}000} = .504$$

$$P(A) = 1 - P(A') = 1 - .504 = \boxed{.496}$$

16. You, your friend, and 7 other people walk up to an empty bar at the exact same time. The bartender serves her customers in a random order. What is the probability that you are served first and your friend is served last?

Let Y = You served First
F = Friend served Last

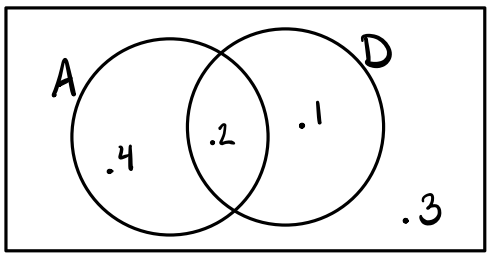
$$P(Y \cap F) = \frac{n(Y \cap F)}{n(S)} = \frac{7!}{9!} = \frac{1}{72}$$



Alternatively,

$$P(Y \cap F) = P(Y)P(F|Y) = \left(\frac{1}{9}\right)\left(\frac{1}{8}\right) = \frac{1}{72}$$

17. A restaurant has found that 60% of its customers order appetizers, 30% of its customers order dessert, and 20% of its customers order both appetizers and dessert. Find the probability that a customer that orders an appetizer will order dessert.



$$P(D|A) = \frac{P(D \cap A)}{P(A)} = \frac{.2}{.6} = \boxed{\frac{1}{3}}$$

18. (a) Fill in the missing probabilities in the table below such that the events A and B are independent.
Hint: There is only one way to do this.

A & B INDEPENDENT: $P(A \cap B) = P(A)P(B)$

$.1248 = P(A)(.48)$

$P(A) = \frac{.1248}{.48} = .26$

	A	A'	
B	.1248	.3552	.48
B'	.1352	.3648	.52
	.26	.74	

$P(A) = P(A \cap B) + P(A \cap B')$

$.26 = .1248 + P(A \cap B')$

$P(A \cap B') = .26 - .1248 = .1352$

AND ALL 4 #'S SUM TO 1.

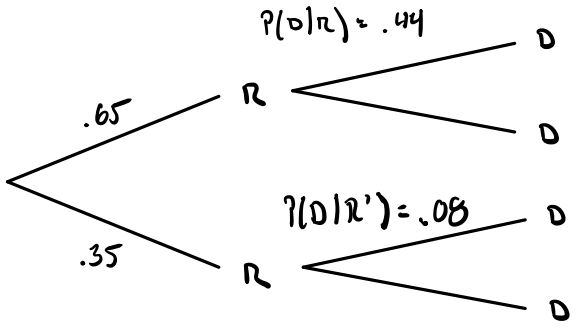
(b) Fill in the missing probabilities in the *same* table below such that the events A and B are *not* independent.
Hint: There are infinitely many ways to do this.

LITERALLY ANY #'S OTHER THAN .1352 & .3648 SUCH THAT ALL 4 #'S ADD UP TO 1.

	A	A'
B	.1248	.3552
B'	.13	.39

19. Delta Airlines flight 5865 is delayed on 44% of all days that it rains and is delayed on 8% of all days that it does not rain. Suppose it is forecasted that there is a 65% chance of rain on Monday.

(a) What is the probability that Delta Airlines flight 5865 will be delayed on Monday?



$P(D) = P(R \cap D) + P(R' \cap D)$

$= P(R)P(D|R) + P(R')P(D|R')$

$= (.65)(.44) + (.35)(.08)$

$= .314$

(b) If you wake up on Monday to an alert on your phone saying that today's Delta Airlines flight 5865 is delayed, what is the probability that it rains today?

$$P(R|D) = \frac{P(R \cap D)}{P(D)} = \frac{P(R)P(D|R)}{P(R)P(D|R) + P(R')P(D|R')}$$

BAYES' FORMULA + LAW OF TOTAL PROBABILITY

$$= \frac{(.65)(.44)}{(.65)(.44) + (.35)(.08)} \approx .9108$$

20. Assume the following data about registered voters in New Yok City is accurate.

- 47% of voters are registered democrats, and 43% of them voted in the last election.
- 34% of voters are registered republicans, and 68% of them voted in the last election.
- 5% of voters are registered with other political parties, and 52% of them voted in the last election.
- 14% of voters are not registered with any political party, and 26% of them voted in the last election.

(a) If a registered voter in New York City is randomly selected, what is the probability that they voted in the last election?

Let S_1 = Democrat
S_2 = Republican
S_3 = Other
S_4 = None
V = vote

Given: $P(S_1) = .47$ $P(V|S_1) = .43$
$P(S_2) = .34$ $P(V|S_2) = .68$
$P(S_3) = .05$ $P(V|S_3) = .52$
$+ \quad P(S_4) = .14$ $P(V|S_4) = .26$
1 ✓

Law of Total Probability

$$P(V) = P(V \cap S_1) + P(V \cap S_2) + P(V \cap S_3) + P(V \cap S_4)$$
$$= P(S_1)P(V|S_1) + P(S_2)P(V|S_2) + P(S_3)P(V|S_3) + P(S_4)P(V|S_4)$$
$$= (.47)(.43) + (.34)(.68) + (.05)(.52) + (.14)(.26) = .4957$$

(b) If a person that voted in the last election is randomly selected, what is the probability that they are a registered republican?

Bayes' Formula

$$P(S_2|V) = \frac{P(S_2)P(V|S_2)}{P(V)}$$
$$= \frac{(.34)(.68)}{.4957} \approx .4664$$

21. A church riases money by selling 2,000 raffle tickets for \$5 each. Ten tickets are chosen to receive a prize of \$50, 3 tickets are chosen to receive aprize of \$250, and 1 ticket is chosen to receive a prize of \$1,000. Let x equal the amount of money that a person wins/loses (positive/negative) by purchasing one raffle ticket.

(a) Describe the probability distribution for x by filling the following table.

x	45	245	995	-5
$p(x)$	$10/2000$	$3/2000$	$1/2000$	$1986/2000$

← THESE PROBABILITIES MUST ADD UP TO 1

(b) Find the expected value $E(x)$.

$E(x) = x_1 p(x_1) + \ldots + x_n p(x_n)$

$= 45\left(\frac{10}{2000}\right) + 245\left(\frac{3}{2000}\right) + 995\left(\frac{1}{2000}\right) - 5\left(\frac{1986}{2000}\right)$

$= -3.875$

22. Consider the following sample of 7 measurements.

57, 68, 87, 94, 59, 66, 80

(a) Calculate the mean.

$$\bar{x} = \frac{57 + 68 + 87 + 94 + 59 + 66 + 80}{7} = \frac{511}{7} = \boxed{73}$$

(b) Calculate the median.

IN ORDER: 57 59 66 **68** 80 87 94

↑ MEDIAN IS IN MIDDLE POSITION

23. Suppose 18% of all lotto tickets win some prize money. If you buy 15 tickets, what is the probability that exactly 5 tickets win some prize money?

BINOMIAL EXPERIMENT

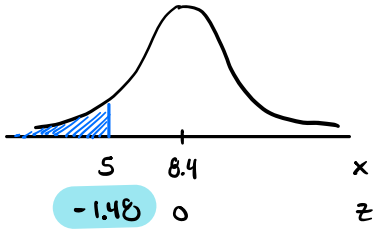
$n = 15$
$p = .18$
$q = .82$

$P(x) = C(n,x)\, p^x q^{n-x}$

$$\boxed{P(5) = C(15,5)(.18)^5(.82)^{10}} \approx .0780$$

24. The amount of time x that each caller spends on hold waiting to speak with a customer service representative is a random variable. Suppose x has a normal distribution with mean $\mu = 8.4$ minutes and standard deviation $\sigma = 2.3$ minutes.

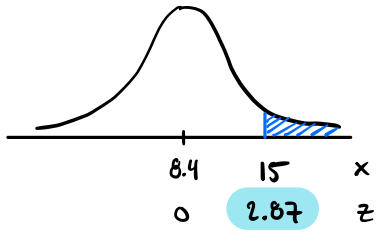
(a) Find the probability that a randomly selected caller waits less than 5 minutes to speak with a customer service representative.



$P(x \le 5) = P(z \le -1.48) =$ **.0694**

$$z = \frac{x - \mu}{\sigma} = \frac{5 - 8.4}{2.3} \approx -1.48$$

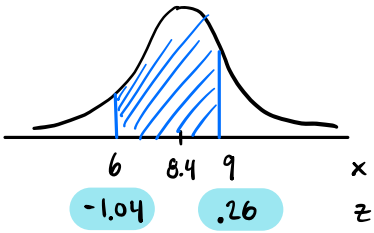
(b) Find the probability that a randomly selected caller waits more than 15 minutes to speak with a customer service representative.



$$P(x \ge 15) = 1 - P(x \le 15)$$
$$= 1 - P(z \le 2.87)$$
$$= 1 - .9979 = \boxed{.0021}$$

$$z = \frac{15 - 8.4}{2.3} \approx 2.87$$

(c) Find the probability that a randomly selected caller waits between 6 and 9 minutes to speak with a customer service representative.



$$P(6 \le x \le 9) = P(x \le 9) - P(x \le 6)$$
$$= P(z \le .26) - P(z \le -1.04)$$
$$= .6026 - .1492$$
$$= \boxed{.4534}$$

$$z = \frac{6 - 8.4}{2.3} \approx -1.04 \qquad z = \frac{9 - 8.4}{2.3} \approx .26$$

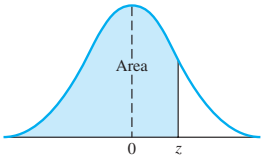


Table 2 — Area Under a Normal Curve to the Left of z, where $z = \dfrac{x - \mu}{\sigma}$

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
−3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
−3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
−3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
−3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
−3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
−2.9	0.0019	0.0018	0.0017	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
−2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
−2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−1.8	0.0359	0.0352	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0722	0.0708	0.0694	0.0681
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
−1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
−1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
−1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
−0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
−0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
−0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
−0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
−0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
−0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
−0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
−0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
−0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
−0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

(*continued*)

Table 2 — Area Under a Normal Curve (*continued*)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9278	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998