Classroom Voting Questions: Statistics

Random Variables

1. Draw the following dart board: A dart board is constructed from three concentric circles with radii 1 inch, 2 inches, and 3 inches, respectively. If a dart lands in the innermost circle, the player receives 4 points. If the dart lands between the innermost circle and the middle circle, the player receives 2 points. If the dart lands between the middle circle and the outermost circle, the player receives 1 point. Assume that the probability of a dart landing in any particular region is proportional to the area of that region.

   Define the random variable X to be the sum of the player's score on two successive throws. Then X is what type of random variable?

   (a) discrete

   (b) continuous

   Answer: (a). The possible values for X are 2, 3, 4, 5, 6, and 8–a countable number of values.

   by Derek Bruff

   STT.04.03.010

   CC HZ MA207 F09: **75**/25 time 1:30
   CC KC MA207 F09: **82**/18 time 2:00
   AS DH MA3321 Su12: **87**/13 time 2:00
   AS DH MA1333 010 F12: **89**/11 time 1:50
   AS DH MA1333 020 F12: **95**/5 time 2:00
   AS DH 1333 010 S13: **100**/0 time 3:00
   AS DH 1333 020 S14: **97**/3 time 2:20 ,
   AS DH 1333 010 F14: **100**/0 time 3:00 ,
   AS DH 1333 020 S15: **96**/4 time 2:40 ,
   AS DH 1333 020 F15: **97**/3 time 2:30 ,
   CC KC MA315 F15: **93**/7
   AS DH 1342 010 F17: **94**/6 time 2:30
   AS DH 1342 020 F18: **86**/14 time 2:40
   AS DH 1342 040 S19: **100**/0 time 3:00
   AS DH 1342 030 F19: **100**/0 time 2:40
   AS DH 1342 030 S20: **94**/6 time 3:20

2. Draw the following dart board: A dart board is constructed from three concentric circles with radii 1 inch, 2 inches, and 3 inches, respectively. If a dart lands in the innermost circle, the player receives 4 points. If the dart lands between the innermost circle and the middle circle, the player receives 2 points. If the dart lands between the middle circle and the outermost circle, the player receives 1 point. Assume that the probability of a dart landing in any particular region is proportional to the area of that region.

   Suppose that a player's score on a single dart throw is defined to be the distance between the dart and the center of the board. Define the random variable X to be the sum of the player's score on two successive throws. Then X is what type of random variable?

   (a) discrete

   (b) continuous

   Answer: (b). The possible values for X are any number between 0 and 6–an uncountable number of values.

   by Derek Bruff

   STT.04.03.020

   CC HZ MA207 F09: 0/**100** time 1:20
   AS DH MA3321 Su12: 0/**100** time 1:30
   AS DH MA1333 010 F12: 0/**100** time 1:30
   AS DH MA1333 020 F12: 19/**81** time 1:40
   AS DH 1333 010 S13: 12/**88** time 1:00
   AS DH 1333 020 S14: 5/**95** time 1:30 ,
   AS DH 1333 010 F14: 8/**92** time 1:40 ,
   AS DH 1333 020 S15: 4/**96** time 1:50 ,
   AS DH 1333 020 F15: 0/**100** time 2:10 ,
   CC KC MA315 F15: 6/**94**
   AS DH 1342 010 F17: 22/**78** time 2:10
   AS DH 1342 020 F18: 11/**89** time 1:50
   AS DH 1342 040 S19: 13/**87** time 1:40
   AS DH 1342 030 F19: 0/**100** time 1:50
   AS DH 1342 030 S20: 50/**50** time 3:00

3. A radioactive mass emits particles at an average rate of 15 particles per minute. Define the random variable X to be the number of particles emitted in a 10-minute time frame. Then X is what type of random variable?

   (a) discrete

   (b) continuous

Answer: (a). The possibles values for X are all integers between 0 and the number of particles in the mass. Even if there were an infinite number of particles in the mass, this would still be a discrete random variable, since the possible values are countable (1, 2, 3, . . .).

by Derek Bruff

STT.04.03.030

CC HZ MA207 F09: **88**/12 time 0:50
CC KC MA207 F09: **44**/56 time 1:40
AS DH MA3321 Su12: **87**/13 time 0:50
AS DH MA1333 010 F12: **78**/22 time 1:00
AS DH MA1333 020 F12: **81**/19 time 1:30
AS DH 1333 010 S13: **81**/19 time 2:00
AS DH 1333 020 S14: **38**/62 time 2:00 ,
AS DH 1333 020 S15: **85**/15 time 2:50 ,
AS DH 1333 020 F15: **85**/15 time 2:30 ,
AS DH 1342 040 S19: **79**/21 time 2:00

4. A radioactive mass emits particles at an average rate of 15 particles per minute. A particle is emitted at noon today. Define the random variable X to be the time elapsed between noon and the next emission. Then X is what type of random variable?

   (a) discrete

   (b) continuous

   Answer: (b) X can take on any positive value, which is an uncountable set of values.

   by Derek Bruff

   STT.04.03.040

   CC HZ MA207 F09: 6/**94** time 0:30
   AS DH MA3321 Su12: 7/**93** time 0:40
   AS DH 1333 010 S13: 19/**81** time 1:50
   AS DH 1333 020 S14: 10/**90** time 1:00 ,
   AS DH 1333 020 S15: 11/**89** time 2:00 ,
   AS DH 1333 020 F15: 4/**96** time 1:50 ,
   AS DH 1342 040 S19: 0/**100** time 1:30

5. A randomly-selected kindergarten class in a large city will get to have a party on Friday of next week. At one point in the party, each child in the class will receive half of a candy bar. Define the random variable X to be the number of candy bars given out in the class next Friday. Then X is what type of random variable?

(a) discrete

(b) continuous

Answer: (a). This questions draws out the fact the discrete-versus-continuous distinction is not an issue of "decimals-versus-not-decimals" but is more subtle.

(a) There are gaps on the real number line between the possible values for X, so X is discrete.

(b) The possible values of X do not constitute an interval on the real number line, so X is not continuous.

by David A. Huckaby

STT.04.03.045

AS DH 3321 010 F16: **100**/0 time 1:40
AS DH 1342 010 F17: **94**/6 time 2:30
AS DH 1342 020 F18: **92**/8 time 2:00
AS DH 1342 040 S19: **73**/27 time 2:00
AS DH 1342 030 F19: **100**/0 time 2:00
AS DH 1342 030 S20: **100**/0 time 2:00

6. Consider the continuous random variable X = the weight in pounds of a randomly selected newborn baby born in the United States during 2006. Let f be the probability density function for X. It is probably safe to say that $P(X < 0) = 0$ and $P(X < 20) = 1$. Which of the following is *not* a justifiable conclusion about f given this information?

(a) No portion of the graph of f can lie below the x-axis.

(b) The area under the entire graph of f equals 1.

(c) The area under the graph of f between $x = 0$ and $x = 20$ is 1.

(d) The nonzero portion of the graph of f lies entirely between $x = 0$ and $x = 19$.

Answer: (d). Since X is a continuous random variable, it can take on values between 19 and 20. There may be some nonzero portion of the graph of f that lies between $x = 19$ and $x = 20$. (In fact, the Guinness Book of World Records lists as the heaviest baby born to a healthy mother a boy weighing 22 pounds, 8 ounces, born in Aversa, Italy, in September 1955.) Draw a graph for f and illustrate these three properties.

by Derek Bruff

STT.04.03.050

AS DH MA3321 Su12: 0/0/8/**92** time 3:00

7. A randomly selected family has two kids. What is the probability that the family has one boy and one girl?

   (a) $\frac{1}{2}$
   (b) $\frac{1}{3}$
   (c) $\frac{1}{4}$
   (d) None of the above

   Answer: (a). There are two ways to have one boy and one girl, either an older boy and a younger girl with a probability of $0.5 * 0.5 = 0.25$, or an older girl and a younger boy also with a probability o $0.5 * 0.5 = 0.25$. So the total probability is 0.25 + 0.25 = 0.5.

   by Kelly Cline

   STT.04.03.055

8. Two standard, six-sided dice are rolled. What is the probability that the sum of the dice is 6?

   (a) $\frac{1}{6}$
   (b) $\frac{5}{6}$
   (c) $\frac{1}{12}$
   (d) $\frac{5}{12}$
   (e) $\frac{1}{36}$
   (f) $\frac{5}{36}$

   Answer: (f).

   by David A. Huckaby

   STT.04.03.060 DH 20

   AS DH MA1333 010 F12: 18/0/6/12/65/**0** time 2:30
   AS DH MA1333 020 F12: 6/11/0/11/72/ time 3:00
   AS DH 1333 010 S13: 11/0/5/0/16/**68** time 2:00
   AS DH 1333 020 S14: 10/3/20/0/3/**63** time 2:20 ,
   AS DH 3321 010 S14: 25/0/8/0/0/**67** time 3:10 ,
   AS DH 1333 010 F14: 9/3/9/12/0/**67** time 3:10 ,
   AS DH 1333 020 S15: 0/0/0/23/5/**73** time 2:20 ,
   AS DH 1333 020 F15: 3/0/6/3/0/**87** time 2:30 ,
   CC KC MA315 F15: 0/0/12/0/0/**81**
   AS DH 1342 010 F17: 3/0/51/6/0/**40** time 3:30
   CC KC MA207 F18: 36/0/0/18/0/**45**
   CC KC MA315 F18: 36/0/6/8/0/**50**
   AS DH 1342 020 F18: 50/0/10/0/0/**40** time 3:00

CC KC MA207 S19: 7/0/14/7/0/**72**
AS DH 1342 040 S19: 0/0/0/6/0/**94** time 2:30
AS DH 1342 030 F19: 18/0/0/0/0/**82** time 2:50
CC KC MA315 S20: 0/0/11/0/0/**89**
AS DH 1342 030 S20: 6/0/29/0/0/**65** time 3:00

9. Two standard, six-sided dice are rolled. What is the most probable sum?

   (a) 2

   (b) 6

   (c) 7

   (d) 12

   Answer: (c).

   by David A. Huckaby

   STT.04.03.070 DH 30

   AS DH MA1333 010 F12: 0/0/**88**/12 time 2:00
   AS DH MA1333 020 F12: 0/0/**100**/0 time 2:20
   AS DH 1333 010 S13: 0/11/**63**/26 time 1:00
   AS DH 1333 020 S14: 0/23/**77**/0 time 2:30 ,
   AS DH 1333 010 F14: 0/17/**83**/0 time 3:10 ,
   AS DH 1333 020 F15: 0/16/**84**/0 time 2:00 ,
   CC KC MA315 F15: 0/7/**93**/0
   AS DH 1342 010 F17: 0/26/**71**/3 time 3:30
   CC KC MA207 F18: 0/23/**77**/0
   CC KC MA315 F18: 0/8/**89**/3
   AS DH 1342 020 F18: 3/8/**70**/20 time 2:30
   CC KC MA207 S19: 0/13/**87**/0
   AS DH 1342 040 S19: 0/0/**100**/0 time 3:10
   AS DH 1342 030 F19: 0/0/**100**/0 time 3:10
   AS DH 1342 030 S20: 0/29/**65**/6 time 2:00

10. Consider rolling a standard, six-sided die. Let A be the event that the number rolled is even. Let B be the event that the number rolled is a multiple of 3. The event $(notB)$ consists of

    (a) $1, 3, 5$

    (b) $1, 2, 4, 5$

    (c) $2, 4, 6$

    (d) $1, 3, 5$

Answer: (b).

by David A. Huckaby

STT.04.03.080 DH 40

AS DH MA1333 010 F12: 6/**88**/6/0 time 1:30
AS DH MA1333 020 F12: 0/**71**/18/12 time 1:40
AS DH 1333 010 S13: 0/**86**/14/0 time 3:00
AS DH 1333 020 S14: 0/**100**/0/0 time 2:20 ,
AS DH 1333 010 F14: 0/**97**/3/0 time 2:50 ,
AS DH 1333 020 S15: 0/**95**/5/0 time 2:30 ,
AS DH 1333 020 F15: 0/**84**/16/0 time 1:40 ,
CC KC MA315 F15: 0/**93**/7/0
AS DH 1342 010 F17: 0/**83**/17/0 time 2:00
CC KC MA207 F18: 0/**68**/27/5
CC KC MA315 F18: 0/**69**/28/3
AS DH 1342 020 F18: 0/**76**/24/0 time 2:30
AS DH 1342 040 S19: 0/**87**/13/0 time 2:20
AS DH 1342 030 F19: 9/**74**/17/0 time 2:30
AS DH 1342 030 S20: 0/**93**/7/0 time 2:40

11. Consider rolling a standard, six-sided die. Let A be the event that the number rolled is even. Let B be the event that the number rolled is a multiple of 3. The event (A and B) consists of

    (a) $2, 3, 4, 6$

    (b) $2, 3, 4, 6, 6$

    (c) 6

    Answer: (c).

    by David A. Huckaby

    STT.04.03.090 DH 50

    AS DH MA1333 010 F12: 71/0/**29** time 1:00
    AS DH MA1333 020 F12: 17/22/**61** time 1:00
    AS DH 1333 010 S13: 33/0/**67** time 2:00
    AS DH 1333 020 S14: 36/4/**60** time 1:50 ,
    AS DH 3321 010 S14: 4/9/**87** time 2:00 ,
    AS DH 1333 010 F14: 0/26/**74** time 2:30 ,
    AS DH 1333 020 F15: 16/0/**84** time 1:20 ,
    CC KC MA315 F15: 11/0/**89** time 1:00
    CC KC MA207 F18: 92/4/**4**
    CC KC MA315 F18: 6/0/**94**
    AS DH 1342 020 F18: 13/0/**87** time 1:40

AS DH 1342 040 S19: 27/0/**73** time 2:10
AS DH 1342 030 F19: 17/4/**78** time 2:20
AS DH 1342 030 S20: 7/0/**93** time 1:40

12. Consider rolling a standard, six-sided die. Let A be the event that the number rolled is even. Let B be the event that the number rolled is a multiple of 3. The event $(AorB)$ consists of

    (a) $2, 3, 4, 6$

    (b) $2, 3, 4, 6, 6$

    (c) 6

    Answer: (a).

    by David A. Huckaby

    STT.04.03.100 DH 60

    AS DH MA1333 010 F12: **100**/0/0 time 0:45
    AS DH MA1333 020 F12: **83**/17/0 time 0:50
    AS DH 1333 010 S13: **100**/0/0 time 1:00
    AS DH 1333 020 S14: **96**/0/4 time 0:50 ,
    AS DH 1333 010 F14: **97**/3/0 time 2:10 ,
    AS DH 3321 010 F14: **83**/17/0 time 2:10 ,
    AS DH 1333 020 S15: **85**/0/15 time 1:20 ,
    AS DH 1333 020 F15: **100**/0/0 time 0:40 ,
    CC KC MA315 F15: **100**/0/0
    AS DH 1342 010 F17: **100**/0/0 time 1:50
    CC KC MA315 F18: **94**/6/0
    AS DH 1342 020 F18: **3**/97/0 time 1:00
    CC KC MA207 S19: **70**/27/3
    AS DH 1342 040 S19: **100**/0/0 time 1:00
    AS DH 1342 030 F19: **96**/4/0 time 1:00
    CC KC MA315 S20: **68**/32/0
    AS DH 1342 030 S20: **100**/0/0 time 1:00

13. A standard, six-sided die is rolled. What is the probability of rolling an even number or a number divisible by 3?

    (a) $\frac{2}{3}$

    (b) $\frac{5}{6}$

    (c) 4

    (d) 5

Answer: (a).

by David A. Huckaby

STT.04.03.110 DH 70

AS DH MA1333 010 F12: **65**/35/0/0 time 1:30
AS DH MA1333 020 F12: **100**/0/0/0 time 2:00
AS DH 1333 010 S13: **81**/19/0/0 time 3:10
AS DH 1333 020 S14: **80**/20/0/0 time 2:30 ,
AS DH 1333 010 F14: **94**/6/0/0 time 3:10 ,
AS DH 1333 020 F15: **88**/12/0/0 time 3:00 ,
CC KC MA315 F15: **96**/4/0/0 time 1:10
AS DH 1342 010 F17: **86**/8/6/0 time 2:40
CC KC MA315 F18: **81**/19/0/0
AS DH 1342 020 F18: **76**/18/5/0 time 3:50
AS DH 1342 040 S19: **100**/0/0/0 time 2:00
AS DH 1342 030 F19: **100**/0/0 time 2:20
CC KC MA315 S20: **81**/19/0/0
AS DH 1342 030 S20: **93**/7/0/0 time 3:00

14. A card is drawn at random from a standard deck of 52 playing cards. What is the probability that the card is a red card or a jack?

    (a) 28

    (b) 30

    (c) $\frac{7}{13}$

    (d) $\frac{15}{26}$

    Answer: (c).

    by David A. Huckaby

    STT.04.03.120 DH 80

    AS DH MA1333 010 F12: 0/0/**71**/29 time 1:40
    AS DH MA1333 020 F12: 0/0/**94**/6 time 2:30
    AS DH 1333 010 S13: 0/0/**71**/29 time 2:40
    AS DH 1333 010 F14: 0/0/**85**/15 time 3:50 ,
    AS DH 1333 020 S15: 0/0/**83**/17 time 2:50 ,
    AS DH 1333 020 F15: 0/0/**89**/11 time 2:50 ,
    AS DH 3321 010 F15: 6/11/**44**/39 time 3:30 ,
    CC KC MA315 F15: 0/0/**82**/18 time 1:30
    CC KC MA315 F18: 0/0/**97**/3
    CC KC MA207 S19: 0/0/**86**/14
    AS DH 1342 040 S19: 0/0/**100**/0 time 3:20