**Unit 6 Review Answers**

1. a. P(X = 3) = 0.28

b. P(X ≤ 3) = 0.16 + 0.22 + 0.28 = 0.66

c. P(1<X≤4) = 0.22 + 0.28 + 0.20 = 0.70

d. E(X) = 1(0.16) + 2(0.22) + 3(0.28) + 4(0.20) + 5(0.14) = 2.94

 Var(X) = (1 – 2.94)2(0.16) + (2 – 2.94)2(0.22) + (3 – 2.94)2(0.28) + (4 – 2.94)2(0.20) + (5 – 2.94)2(0.14)

 Var(X) = 1.6164

 SD(X) = 1.2714

1. Probability model for the payout of a prize

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X = payout | -$2 | $73 | $148 | $248 | $498 |
| P(X=x) | 1496/1500 | 1/1500 | 1/1500 | 1/1500 | 1/1500 |

*For (b) and (c), just put X-values in L1, probabilities in L2 and then do 1-var stats L1, L2:*

b. E(X) = -$1.35

c. SD(X) = $15.06

d. E(X + X + X) = -1.35 + -1.35 + -1.35 = -$4.05

 SD(X + X + X) = 

1. SAT Scores

M – score for a randomly selected male E(M) = 1532 SD(M) = 312

F – score for a randomly selected female E(F) = 1506 SD(F) = 304

1. M + F;

E(M + F) = 1532 + 1506 = 3038

SD(M + F) = 

1. M – F

E(M – F) = 1532 – 1506 = 26

SD(M – F) = 

1. Assume a normal model with N(26, 435.61).

Female scored higher than male 🡪 P(F > M) 🡪 P(M – F < 0)

 P(M – F < 0) = normalcdf(-E99, 0, 26, 435.61) = 0.4762

There is a 47.62% probability that a randomly selected female scored higher than a randomly selected male on the SAT.

1. Random Variables

|  |  |  |
| --- | --- | --- |
|  | Mean | SD |
| X | 12 | 5 |
| Y | 18 | 8 |

**a.** -2X **b.** 4Y – 7

E(-2X) = -2(12) = -24 E(4Y – 7) = 4(18) – 7 = 65

SD(-2X) = 2(5) = 10 SD(4Y – 7) = 4(8) = 32

**c.** X + Y **d.** X – Y

E(X + Y) = 12 + 18 = 30 E(X – Y) = 12 – 18 = -6

SD(X + Y) =  SD(X – Y) = 

**e.** X1 + X2 **f.** 2X – 4Y

E(X1 + X2) = 12 + 12 = 24 E(2X – 4Y) = 2(12) – 4(18) = -48

SD(X1 + X2) =  E(2X – 4Y) = 

1. Long Distance Calls
	1. E(X) = 15.5 minutes; SD(X) = 5.679 minutes
	2. C = 0.015X + 0.60

E(C) = $0.8325

SD(C) = $0.0852

* 1. E(C + T) = $1.0325

SD(C + T) = $0.1374

* 1. E(C – T) = $0.6325; Call cost more

SD(C – T) = $0.131S4

1. Check: Bernoulli?

1. 2 Outcomes – has jumper cables or doesn’t have jumper cables

10% Condition – 80 drivers asked is less than 10% of all drivers.

2. *p* = 0.40 and assumed fixed

3. Assumed independent

1. Define Y = yes, someone can jump your car

Define N = no, someone cannot jump your car

P(N $∩$ N $∩$ N $∩$ N $∩$ N $∩$ N $∩$ Y) = (0.60)6(0.40) = 0.0187

***OR*** Geom(0.40) P(X = 7) = geometpdf(0.40, 7) = 0.0187

1. Geom(0.40) P(X < 5) = geometcdf(0.40, 5) = 0.92224

***OR***

Binom(5, 0.40) 1-P(X = 0) = 1-binompdf(5, 0.40, 0) = 0.92224

1. Geom(0.40)

E(X) = drivers

1. Binom(8, 0.40)

P(X = 3) = binompdf(8, 0.4, 3) = 0.2787

1. Binom(6, 0.40)



1. Binom(10, 0.40)



1. Binom(12, 0.40)

E(X) = *np* = 12(0.40) = 4.8 drivers

1. Binom(80, 0.40)
	* 1. CHECK: Success/Failure Condition

*np* = 80(0.40) = 32 ≥ 10

*nq* = 80(0.60) = 48 ≥ 10

Since there were at least 10 expected successes and 10 failures we can use the normal model to approximate the binomial probabilities.

* + 1. N(32,4.382)
		2. P(X ≤ 30) = normalcdf(-E99, 30, (80\*0.40), $\sqrt{(80\*0.40\*0.60)}$ ) = 0.324
		3. P(42 < X < 61) = normalcdf(42, 61, 32, 4.382) = 0.0112
1. Will Fumble

Bernoulli?

1. 2 Outcomes – catches or doesn’t catch

2. *p* = 0.15 and fixed

3. Assumed independent

1. Binom(6, 0.15) P(X = 2) = 0.1762
2. Binom(8, 0.15) P(X ≥ 3) = 0.1052
3. G(0.15) P(X = 4) = 0.0921
4. G(0.15) P(X = 5) + P(X = 6) = 0.1449
5. Binom(10, 0.15) P(X < 2) = 0.5443
6. Binom(12, 0.15) E(X) = 1.8 catches SD(X) = 1.237 catches
7. G(0.15) E(X) = 6.67 passes
8. Binom(25, 0.15) P(9 ≤ X ≤ 14) = 0.0080
9. Binom(70, 0.15)
	1. Success/Failure: *np* = 10.5 ≥ 10

 *nq* = 59.5 ≥ 10

 Normal model is appropriate

* 1. N(10.5, 2.987)
	2. P(X = 20) = binompdf(70, 0.15, 20) = 0.0016

*Note: you cannot find individual probabilities (equal to probabilities) using normalcdf. So you need to go back to Binompdf to find the probability of X = 20.*

* 1. P(11 < X < 29) = 0.4335