

5.3 Foundations of Math II

P. 233 # 1-3, 11

1. a) Class A:

$$\bar{X} = \frac{94 + 56 + 89 + 67 + 84}{5} = \frac{390}{5} = 78$$

$$\sigma = \sqrt{\frac{(78-94)^2 + (78-56)^2 + (78-89)^2 + (78-67)^2 + (78-84)^2}{5}}$$

$$\sigma = \sqrt{\frac{256 + 484 + 121 + 121 + 36}{5}} = \sqrt{\frac{1018}{5}} = \sqrt{203.6} = 14.27$$

Class B

$$\bar{X} = \frac{84 + 77 + 76 + 81 + 74}{5} = \frac{392}{5} = 78.4$$

$$\sigma = \sqrt{\frac{(78.4-84)^2 + (78.4-77)^2 + (78.4-76)^2 + (78.4-81)^2 + (78.4-74)^2}{5}}$$

$$\sigma = \sqrt{\frac{31.36 + 1.96 + 5.76 + 6.76 + 19.36}{5}} = \sqrt{\frac{65.2}{5}} = \sqrt{13.04} = 3.61$$

c) Class B has more consistent marks because it has a lower standard deviation.

2. $\bar{X} = \frac{135 + 141 + 109 + 156 + 127 + 131 + 118 + 124 + 129 + 133 + 139 + 123}{12}$

$$\bar{X} = \frac{1565}{12} = 130.42$$

$$\sigma = \sqrt{\frac{(130-135)^2 + (130-141)^2 + (130-109)^2 + (130-156)^2 + (130-127)^2 + (130-131)^2 + (130-118)^2 + (130-124)^2 + (130-129)^2 + (130-133)^2 + (130-139)^2 + (130-123)^2}{12}}$$

$$\sigma = \sqrt{\frac{25 + 121 + 441 + 676 + 9 + 1 + 144 + 36 + 1 + 9 + 81 + 49}{12}}$$

$$\sigma = \sqrt{\frac{1593}{12}} = \sqrt{132.75} = 11.52$$

Note: $(130-135)^2 = (-5)^2 = 25$ and $(135-130)^2 = 5^2 = 25$

So it doesn't matter which order it is in! just be consistent!

$$1+3+4+7+9+14+11+8+6+5+3+1=72$$

P.233 cont.

$$3. a) \bar{x} = \frac{1(103) + 3(108) + 4(113) + 7(118) + 9(123) + 14(128) + 11(133) + 8(138) + 6(143) + 5(148) + 3(153) + 1(158)}{72}$$

$$\bar{x} = \frac{9386}{72} = 130.36$$

$$\sigma = \sqrt{\frac{(130.36-103)^2 + 3(130.36-108)^2 + 4(130.36-113)^2 + 7(130.36-118)^2 + 9(130.36-123)^2 + 14(130.36-128)^2 + 11(130.36-133)^2 + 8(130.36-138)^2 + 6(130.36-143)^2 + 5(130.36-148)^2 + 3(130.36-153)^2 + (130.36-158)^2}{72}}$$

$$\sigma = \sqrt{\frac{748.5696 + 1499.9088 + 1205.4784 + 1069.3872 + 487.5264 + 77.9744 + 76.6656 + 466.9568 + 958.6176 + 1555.848 + 1537.7088 + 763.9696}{72}}$$

$$\sigma = \sqrt{\frac{10448.6112}{72}} = \sqrt{145.1196} = 12.05$$

b) Ali's data is very similar to the team's data.

$$11. 2+13+42+53+42+36+8+4=200$$

$$\bar{x} = \frac{2(28) + 13(33) + 42(38) + 53(43) + 42(48) + 36(53) + 8(58) + 4(63)}{200}$$

$$\bar{x} = \frac{9000}{200} = 45$$

$$\sigma = \sqrt{\frac{2(28-45)^2 + 13(33-45)^2 + 42(38-45)^2 + 53(43-45)^2 + 42(48-45)^2 + 36(53-45)^2 + 8(58-45)^2 + 4(63-45)^2}{200}}$$

$$\sigma = \sqrt{\frac{578 + 1872 + 2058 + 212 + 378 + 2304 + 1352 + 1296}{200}}$$

$$\sigma = \sqrt{\frac{10050}{200}} = \sqrt{50.25} = 7.09$$

Yes, he needs to hire more employees - the standard deviation is 7.09 which is higher than 6.