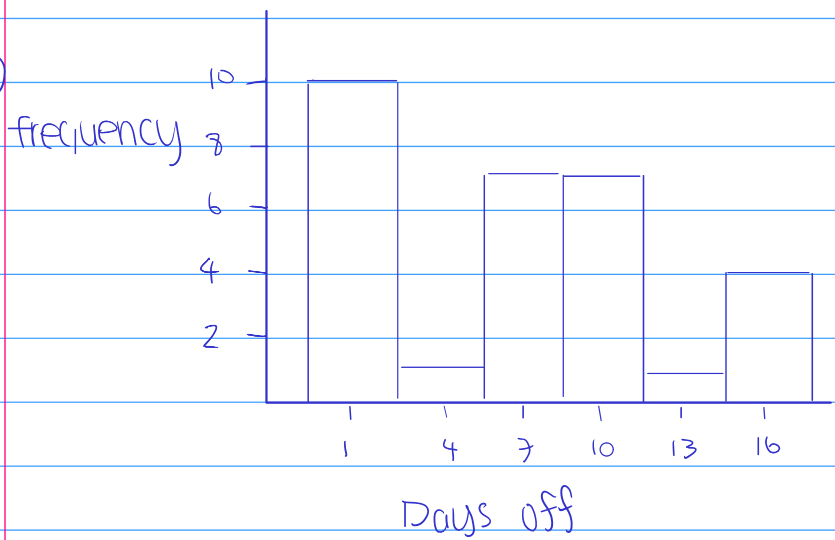
1) Total = 270

| Income | Frequency | Relative Frequency (percent) |
|---|---|---|
| 200 – 300 | 55 | 19,93 % |
| 301 – 400 | 70 | 25,36 % |
| 401 – 500 | 73 | 26,45 % |
| 501 – 600 | 68 | 24,64 % |
| more than 600 | 10 | 3,62 % |

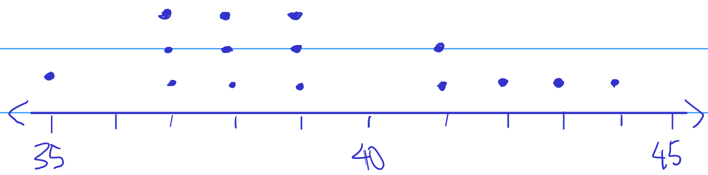
2)




It does not appear normal. It is not bell-shaped or symmetric

3) It appears normal. It is bell-shaped and symmetric.

4) ~~38~~ ~~39~~ ~~37~~ ~~37~~ ~~44~~ ~~38~~ ~~41~~ ~~38~~ ~~39~~ ~~35~~ ~~42~~ ~~39~~ ~~43~~ ~~37~~ ~~41~~



5) $\dfrac{516 + 608 + 356 + 352 + 496 + 349 + 350 + 525 + 470 + 482}{10}$

$= 450.4$

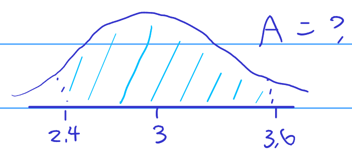
6) $\dfrac{3 + (-8) + 3 + (-9) + 11 + (-9) + 14 + 0 + 13 + (-5) + 14 + 7}{12}$

$= 2.8$ lb

7) $\dfrac{22 + 29}{2} = 25.5$ years

8) $S = \sqrt{\dfrac{\Sigma(x_i - \bar{x})^2}{n-1}} = 18.9$

9) A = normalcdf(2.4, 3.6, 3, 0.6) = 0.6827
68.27 % of the students at the college have a GPA between 2.4 and 3.6.




10) $z_1 = \dfrac{92 - 71}{15} = 1.4$

$z_2 = \dfrac{688 - 493}{150} = 1.3$

A score of 92 has higher relative score.

11) 49 52 52 52 55 55 67 74

$L = 0.75n = 0.75(8) = 6$

$Q_3 = \dfrac{L(L+1)}{2} = \dfrac{55 + 67}{2} = 61$

12) $P(\text{earn at } \$77000) = \frac{14}{20} = 0.7$

13) $P(\text{false positive}) = \frac{28}{273} = 0.1026$

The probility is high so the test is low in accuracy.

14) $P(\text{pass}) = \frac{12}{20} = 0.6$

15) $P(\text{regular or heavy}) = \frac{157+69}{997} = 0.2267$

16) $P(\text{good}) = \left(\frac{54}{64}\right)^5 = 0.428$

17) $P(\text{both heavy}) = \left(\frac{86}{991}\right)\left(\frac{85}{990}\right) = 0.007451$

18)

| | P | value |
|---|---|---|
| live | 0.9994 | -181 |
| not live | 0.0006 | 150000 |

$E(x) = 0.9994(-181) + 0.0006(150000) = -90.89$

19) $n = 11,\ p = 0.2$

$P(X \le 3) = \text{binomcdf}(11, 0.2, 3) = 0.839$

20) $n = 73,\ p = 0.94$

$P(X > 71) = 1 - \text{binomcdf}(73, 0.94, 71) = 0.062$

21) $n = 8$ , $p = 0.46$

$p(x = 4) = \text{binompdf}(8, 0.46, 4) = 0.2665$

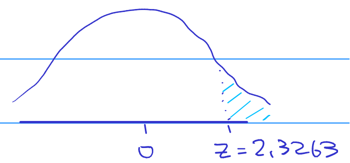
22) $\mu = 70$ , $\sigma = 10$ , $n = 25$

$\mu_{\bar{x}} = \mu = 70$

$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{10}{\sqrt{25}} = 2$

$p(x > 72.8) = \text{normalcdf}(72.8, \infty, 70, 2) = 0.0808$

23) $n = 300$, $x = 112$ , c-level $= 0.98$




$z = \text{invNorm}(0.98, 0, 1, \text{center}) = 2.3263$

$\hat{p} = \dfrac{x}{n} = \dfrac{112}{300} = 0.3733$

$m = z \cdot \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}} = 2.3263 \sqrt{\dfrac{0.3733(1-0.3733)}{300}}$

$= 0.0650$

$0.3733 - 0.065 < p < 0.3733 + 0.0650$

We are 98% confidence that the true population proportion of all New York State union members who favor the Republican candidate is between 0.3083 and 0.4383

24) $\sigma = 26$ , $m = 0.04$ , c-level $= 0.96$

$z = \text{invNorm}(0.96, 0, 1, \text{center}) = 2.0537$

since $\hat{p}$ is unknown , we use $\hat{p} = 0.5$

$n = 0.25 \left(\dfrac{2.0537}{0.04}\right)^2 = 659.01 \approx 660$

25) $n = 10$, c-level $= 0.95$, $S_x = 2.1379$, $\bar{x} = 9.48$

$\frac{\alpha}{2} = \frac{1-0.95}{2} = 0.025$

$t_{\alpha/2} = \text{invT}(1-0.025, 10-1) = 2.2622$

$m = 2.2622\left(\frac{2.1379}{\sqrt{10}}\right) = 1.5294$

$9.48 - 1.5294 < \mu < 9.48 + 1.5294$

We are 95% confidence that the mean time for all players is between 7.9506 and 11.0094

26) c-level $= 0.95$, $m = 2$, $\sigma = 60$

$z = \text{invNorm}(0.95, 0, 1, \text{center}) = 1.95996$

$n = \left(\frac{z \cdot \sigma}{m}\right)^2 = \left(\frac{1.95996 \cdot 60}{2}\right)^2$

$= 3457.30 \approx 3458$

27) $n = 234$, $x = 96$, $\alpha = 0.05$, $\hat{p} = 0.41$

$H_0: p = 0.34$

$H_1: p > 0.34$

1-prop Z Test:

Test statistic: $z = \frac{0.41 - 0.34}{\sqrt{\frac{0.34(1-0.34)}{234}}} = 2.2687$

p-value: $p = \text{normalcdf}(2.2687, \infty, 0, 1)$
$= 0.0116$

Since $p < \alpha$, we reject $H_0$.

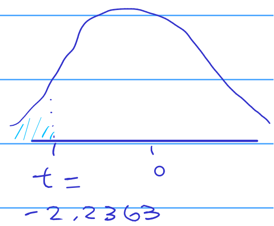
There is enough evidence to conclude that the figure is higher for fathers in the town of Littleton

28) $\mu = 30000$, $n = 17$, $\bar{x} = 22298$, $s = 14200$, $\alpha = 0.05$

$H_0: \mu_0 = 30000$

$H_1: \mu_0 < 30000$

T Test:




Test statistic: $t = \dfrac{22298 - 30000}{\frac{14200}{\sqrt{17}}} = -2,2363$

p-value: $p = \text{tcdf}(-\infty, -2,2363, 17-1)$

$= 0,01996$

Since $p < \alpha$, we reject $H_0$

There is enough evidence to conclude that the mean annual salary is less than \$ 30000

29) 1: College A  2: College B

$\bar{x}_1 = 3,1125$  $\bar{x}_2 = 3,4385$

$s_1 = 0,4359$  $s_2 = 0,5485$

$n_1 = 8$  $n_2 = 13$

$\alpha = 0,1$

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$

2-sample T Test:

Test statistic: $t = \dfrac{(3,1125 - 3,4385)}{\sqrt{\frac{0,4359^2}{8} + \frac{0,5485^2}{13}}} = -1,5077$

p-value: $p = 1 - \text{tcdf}(-1,0485, 1,0485, 8-1)$

$= 0.1500$

Since $p > \alpha$, we do not reject $H_0$.

There is not enough evidence to conclude that the mean GPA of students at College A is different from College B.

30) 1: Before  2: After

$\bar{d} = -5.2$ , $s_d = 5.4450$ , $n_d = 5$ , $\alpha = 0.01$

$H_0: \mu_d = 0$

$H_0: \mu_d \neq 0$

T Test:

Test Statistic: $t = \dfrac{-5.2}{\left(\frac{5.4450}{\sqrt{5}}\right)} = -2.1355$

p-value : $p = 1 - \text{tcdf}(-2.1355, 2.1355, 5-1)$
$= 0.0996$

Since $p > \alpha$, we do not reject $H_0$.
There is not enough evidence to conclude that the tutoring has an effect on the math scores.

31) $L_1$ = performance , $L_2$ = Attitude
$r$ = LinReg ($L_1$, $L_2$) = 0.8632

32) $r = 0.942$, $\hat{y} = 3x$ , $\bar{y} = 12.75$
$y = 3(4.6) = 13.8$
It is not on exam

33) $y = 5.074 + 0.753x$

34) $H_0$: the response occur according to the percentage
$H_1$: the response do not occur according to the percentage
total = 80 , n = 5 , $\alpha = 0.05$

| expected | observed |
|---|---|
| A = 80 (0.15) = 12 | 12 |
| B = 80 (0.20) = 16 | 15 |
| C = 80 (0.25) = 20 | 16 |
| D = 80 (0.25) = 20 | 18 |
| E = 80 (0.15) = 12 | 19 |

$\chi^2 = 5.1458$
$p = 0.2727$

Since $p > \alpha$, we do not reject $H_0$
There is not enough evidence to conclude the response do not occur according to the percentage

35) total = 10000 , n = 4 , $\alpha = 0.05$

| | observed | expected |
|---|---|---|
| Washington | 450 | 1000 (0.51) = 510 |
| Oregon | 340 | 1000 (0.30) = 300 |
| Idaho | 150 | 1000 (0.11) = 110 |
| Montana | 60 | 1000 (0.08) = 80 |

$H_0$: agrees with the distribution of state populations
$H_1$: does not agree
$\chi^2$ GOF - Test
L1: observed
L2: expected
$\chi^2 = 31.9376$
$p = 5.3943 \times 10^{-7}$
Since $p < \alpha$, we reject $H_0$.
There is enough evidence to conclude that the sample distribution does not agree with the distribution of state population.

36) $\alpha = 0.05$

| Brand | A | B | C | |
|---|---|---|---|---|
| | $n_1 = 10$ | $n_2 = 10$ | $n_3 = 10$ | $\bar{\bar{x}} = 30.6333$ |
| | $\bar{x}_1 = 32.1$ | $\bar{x}_2 = 32.6$ | $\bar{x}_3 = 27.2$ | $I = 3$ |
| | $s_1^2 = 4.37$ | $s_2^2 = 3.61$ | $s_3^2 = 3.34$ | $N = 30$ |

$H_0: \mu_1 = \mu_2 = \mu_3$

$H_1$: two or more $\mu_i$ are different

$$SSTr = n_1(\bar{x}_1 - \bar{\bar{x}})^2 + n_2(\bar{x}_2 - \bar{\bar{x}})^2 + n_3(\bar{x}_3 - \bar{\bar{x}})^2$$
$$= 10(32.1 - 30.63)^2 + 10(32.6 - 30.63)^2 + 10(27.2 - 30.63)^2$$
$$= 178.067$$

$$SSE = (10-1)(4.37) + (10-1)(3.61) + (10-1)(3.34)$$
$$= 101.88$$

$$MSTr = \frac{SSTr}{I-1} = \frac{178.067}{3-1} \simeq 89.0335$$

$$MSE = \frac{SSE}{N-I} = \frac{101.88}{30-3} = 3.7733$$

Test Statistic : $F = \frac{MSTr}{MSE} = \frac{89.0335}{3.7733} = 23.5957$

Since $F > 1$, we reject $H_0$.

There is enough evidence to conclude that the populations do not have the same mean.

37) $\alpha = 0.025$

$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$

$H_1$: two or more $\mu_i$ are different

$L_1$ = Brand A, $L_2$ = Brand B, $L_3$ = Brand C, $L_4$ = Brand D

ANOVA $(L_1, L_2, L_3, L_4)$

$F = 6.6986$

$p = 0.0028$

Since $p < \alpha$, we reject $H_0$

There is enough evidence to conclude that the four brands have different mean.