

$$1. \quad 2.71 + 1.645 \cdot \frac{0.51}{\sqrt{120}} = 2.71 \pm 0.074 = (2.633; 2.787)$$

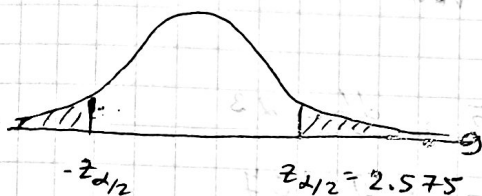
With 90% confidence the mean GPA of all students at the university falls in the interval $(2.633; 2.787)$

$$2. \quad n = \frac{(z_{\alpha/2})^2 \cdot \sigma^2}{(ME)^2} = \frac{(1.96)^2 \cdot 27^2}{4^2} \approx 400,13 \approx 401 \text{ workers}$$

$401 - 81 = 620$ workers need to be included in the sample to provide confidence interval with length 4.

$$3. \quad a) \quad H_0: \mu = 25 \quad z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{28 - 25}{\frac{3}{\sqrt{81}}} = \frac{3 \cdot 9}{3} = 9$$

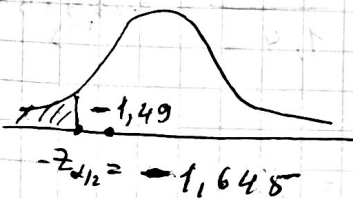
$$H_a: \mu \neq 25$$



We reject H_0 .

$$b) \quad H_0: \mu = 12 \quad z = \frac{11 - 12}{\frac{4.5}{\sqrt{45}}} = \frac{-1}{0.67} \approx -1.49$$

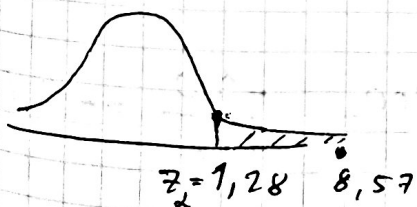
$$H_a: \mu < 12$$



We do not reject H_0

$$c) \quad H_0: \mu = 40 \quad z = \frac{46 - 40}{\frac{4}{\sqrt{100}}} = \frac{6}{0.4} \approx 15.7$$

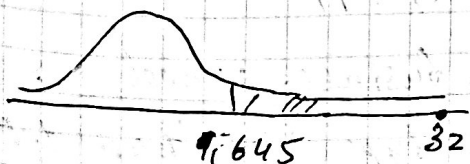
$$H_a: \mu > 40$$



We reject H_0 .

$$4. \quad H_0: \mu = 2116 \quad z = \frac{2345 - 2116}{\frac{210}{\sqrt{900}}} = \frac{229}{7} \approx 32.7$$

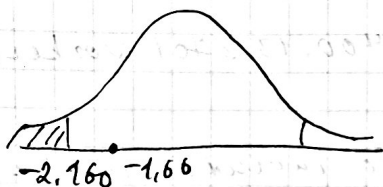
$$H_a: \mu > 2116$$



We reject H_0 \Rightarrow

People with a bachelor's degree earn an average more than \$ 2116.

5. a) $H_0: \mu = 60$ $t = \frac{56-60}{\frac{9}{\sqrt{14}}} = \frac{-4}{2,405} = -1,66$
 $H_a: \mu \neq 60$

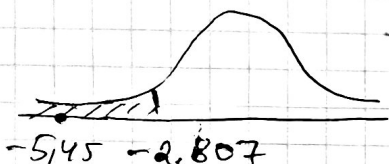


$\alpha = 0,05 \Rightarrow \alpha/2 = 0,025$
 $df = 13$

$t_{\alpha/2, 13} = -2,160$

We don't reject H_0

b) $H_0: \mu = 35$ $t = \frac{29-35}{\frac{5,4}{\sqrt{24}}} = \frac{-6}{1,1} = -5,45$
 $H_a: \mu < 35$

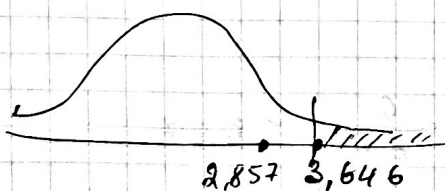


$\alpha = 0,005$, $df = 23$

$t_{\alpha} = -2,807$

We reject H_0 .

c) $H_0: \mu = 47$ $t = \frac{51-47}{\frac{6}{\sqrt{18}}} = \frac{4}{1,4} = 2,857$
 $H_a: \mu > 47$

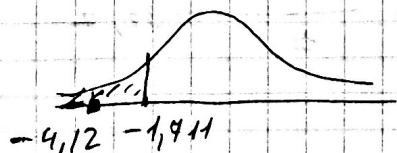


$\alpha = 0,001$, $df = 17$

$t_{0,001, 17} = 3,646$

We do not reject H_0 .

6. $H_0: \mu = 1200$ $t = \frac{1130-1200}{\frac{85}{\sqrt{25}}} = \frac{-70}{17} = -4,12$
 $H_a: \mu < 1200$



$\alpha = 0,05$, $df = 24$

$t_{\alpha} = -1,711$

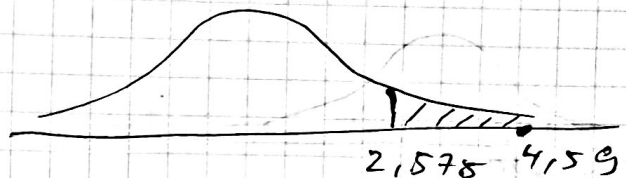
We reject H_0 . Claim of the business school is false. Students who complete a course can type less than 1200 words/h.

7. $H_0: \mu_1 = \mu_2$
 $H_a: \mu_1 \neq \mu_2$

~~$z = \frac{5,58 - 4,80}{\sqrt{\frac{1,62^2}{155} + \frac{1,52^2}{190}}} = \frac{0,78}{\sqrt{0,017 + 0,012}} = \frac{0,78}{\sqrt{0,029}} = \frac{0,78}{0,17} = 4,59$~~

$z = \frac{5,58 - 4,80}{\sqrt{\frac{1,62^2}{155} + \frac{1,52^2}{190}}} = \frac{0,78}{\sqrt{0,017 + 0,012}} = \frac{0,78}{\sqrt{0,029}} = \frac{0,78}{0,17} = 4,59$

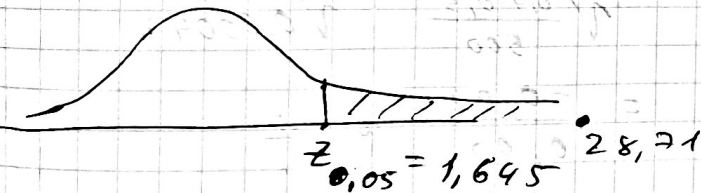
$z_{d/2} = 2,575$



We reject H_0

8. $H_0: \mu_1 = \mu_2$
 $H_a: \mu_1 > \mu_2$

$z = \frac{13,62 - 11,61}{\sqrt{\frac{1,85^2}{1000} + \frac{1,4^2}{1200}}} = \frac{2,01}{\sqrt{0,0034 + 0,0016}} = \frac{2,01}{\sqrt{0,005}} = \frac{2,01}{0,07} = 28,71$



We reject H_0 .

With 95% confidence

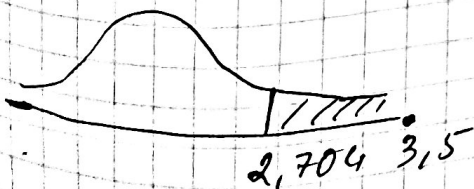
daily wage of transportation

workers higher than wage of factory workers.

9. $H_0: \mu_1 = \mu_2$
 $H_a: \mu_1 \neq \mu_2$

$s_p^2 = \frac{(20-1) \cdot 5,25^2 + (22-1) \cdot 4,55^2}{20+22-2} = \frac{958,44}{40} = 23,961$

$t = \frac{33,75 - 28,50}{\sqrt{23,96 \left(\frac{1}{20} + \frac{1}{22} \right)}} = \frac{5,25}{\sqrt{2,3}} = \frac{5,25}{1,5} = 3,5$



We reject H_0

$d = 0,01 \rightarrow d/2 = 0,005$

$df = 40$

$t_{d/2} = 2,704$

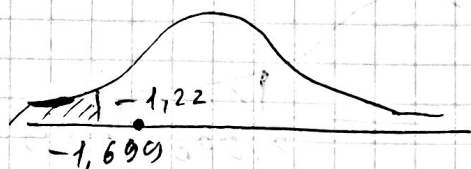
$$H_0: \mu_1 = \mu_2$$

$$H_a: \mu_1 < \mu_2$$

$$s_p^2 = \frac{(16-1) \cdot 6,4^2 + (15-1) \cdot 7,3^2}{16+15-2} =$$

$$= \frac{1360,46}{29} = 46,91$$

$$t = \frac{45,3 - 48,3}{\sqrt{46,91 \cdot \left(\frac{1}{16} + \frac{1}{15}\right)}} = \frac{-3}{\sqrt{46,91 \cdot 0,13}} = \frac{-3}{\sqrt{6,06}} = -1,22$$



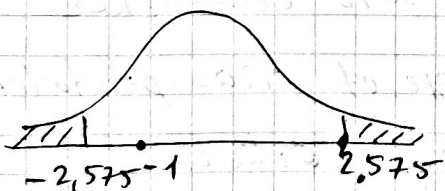
$$t_{0,05; df=29} = -1,699$$

We do not reject H_0 . It means that mean score for all male and female students can be the same, but we have not sufficient evidence to accept this statement.

11. a) $H_0: p_0 = 0,7$

$$H_a: p_0 \neq 0,7$$

$$z = \frac{\frac{340}{500} - 0,7}{\sqrt{\frac{0,7 \cdot 0,3}{500}}} = \frac{-0,02}{\sqrt{0,00042}} = \frac{-0,02}{0,02} \approx -1$$



$$z_{\alpha/2} = 2,575$$

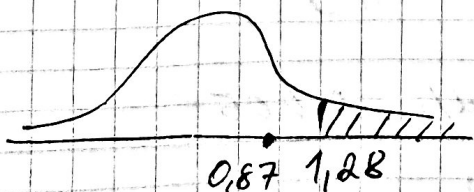
We do not reject H_0

b)

$$H_0: p_0 = 0,3$$

$$H_a: p_0 > 0,3$$

$$z = \frac{\frac{45}{230} - 0,3}{\sqrt{\frac{0,3 \cdot 0,7}{230}}} = \frac{0,026}{\sqrt{0,0009}} = \frac{0,026}{0,03} \approx 0,87$$



$$z_{\alpha} = 1,28$$

$$\alpha = 0,1$$

We do not reject H_0 .