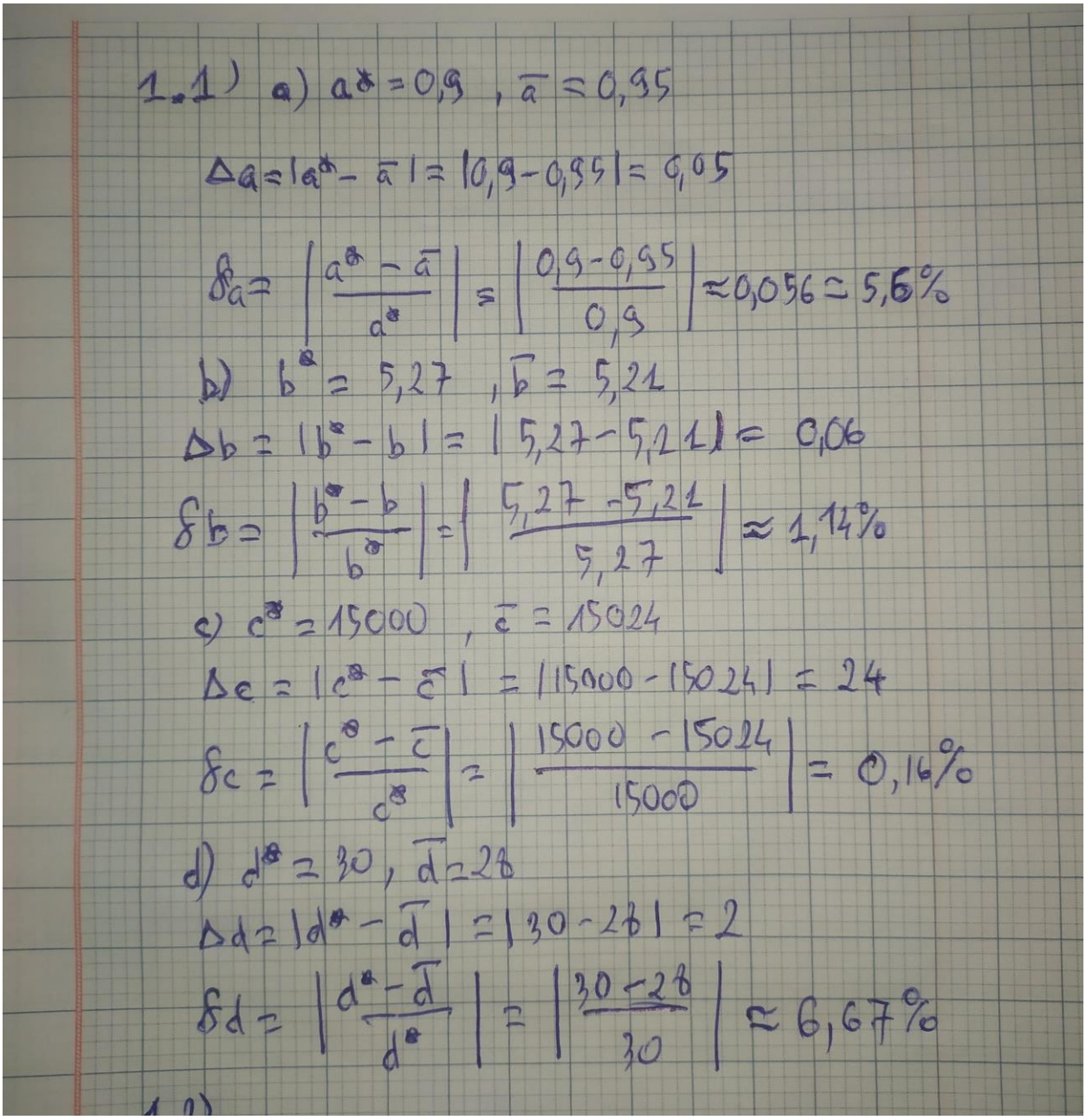
CHƯƠNG 1

1.1

Lưu Đức Vũ - 19120433



1.1) a) $a^* = 0,9$, $\bar{a} = 0,95$

$\Delta a = |a^* - \bar{a}| = |0,9 - 0,95| = 0,05$

$\delta a = \left|\frac{a^* - \bar{a}}{a^*}\right| = \left|\frac{0,9 - 0,95}{0,9}\right| \approx 0,056 \simeq 5,6\%$

b) $b^* = 5,27$, $\bar{b} = 5,21$

$\Delta b = |b^* - b| = |5,27 - 5,21| = 0,06$

$\delta b = \left|\frac{b^* - b}{b^*}\right| = \left|\frac{5,27 - 5,21}{5,27}\right| \approx 1,14\%$

c) $c^* = 15000$, $\bar{c} = 15024$

$\Delta c = |c^* - \bar{c}| = |15000 - 15024| = 24$

$\delta c = \left|\frac{c^* - \bar{c}}{c^*}\right| = \left|\frac{15000 - 15024}{15000}\right| = 0,16\%$

d) $d^* = 30$, $\bar{d} = 28$

$\Delta d = |d^* - \bar{d}| = |30 - 28| = 2$

$\delta d = \left|\frac{d^* - \bar{d}}{d^*}\right| = \left|\frac{30 - 28}{30}\right| \approx 6,67\%$

1.2)

1.2

Lưu Đức Vũ - 19120433

1.2) a) $a^* = 7,56$, $\Delta a = 0,35$

$\Delta a = |a^* - \bar{a}| \Rightarrow \bar{a} \approx a^* \pm \Delta a$

$\bar{a} = 7,21$ hoặc $\bar{a} = 7,91$

$\delta a = \left| \frac{a^* - \bar{a}}{a^*} \right| = \frac{\Delta a}{a^*} \approx 4,63\%$

b) $b^* = 2,87$, $\delta b = 2,5\%$

$\delta b = \frac{\Delta b}{b^*} \Rightarrow \Delta b = b^* . \delta b = 0,07175$

$\Rightarrow \bar{b} = 2,94175$ hoặc $\bar{b} = 2,79825$

c) $\bar{c} = 1,156$, $\delta c = 0,05$

$\delta c = \left| \frac{c^* - \bar{c}}{c^*} \right| \Leftrightarrow \delta c . c^* = |c^* - \bar{c}|$

$\hookrightarrow \begin{bmatrix} c^* - \bar{c} = +\delta c . c^* \\ c^* - \bar{c} = -\delta c . c^* \end{bmatrix} \hookrightarrow \begin{bmatrix} c^* \approx 1,21684 \\ c^* \approx 1,10095 \end{bmatrix}$

~~Đặt $c^* = 1,21684 \Rightarrow \Delta c = |c^* - \bar{c}| =$~~

Đặt $\begin{bmatrix} c^* = 1,21684 \Rightarrow \Delta c = \delta c . c^* = 0,060842 \\ c^* = 1,10095 \Rightarrow \Delta c = \delta c . c^* = 0,0550475 \end{bmatrix}$

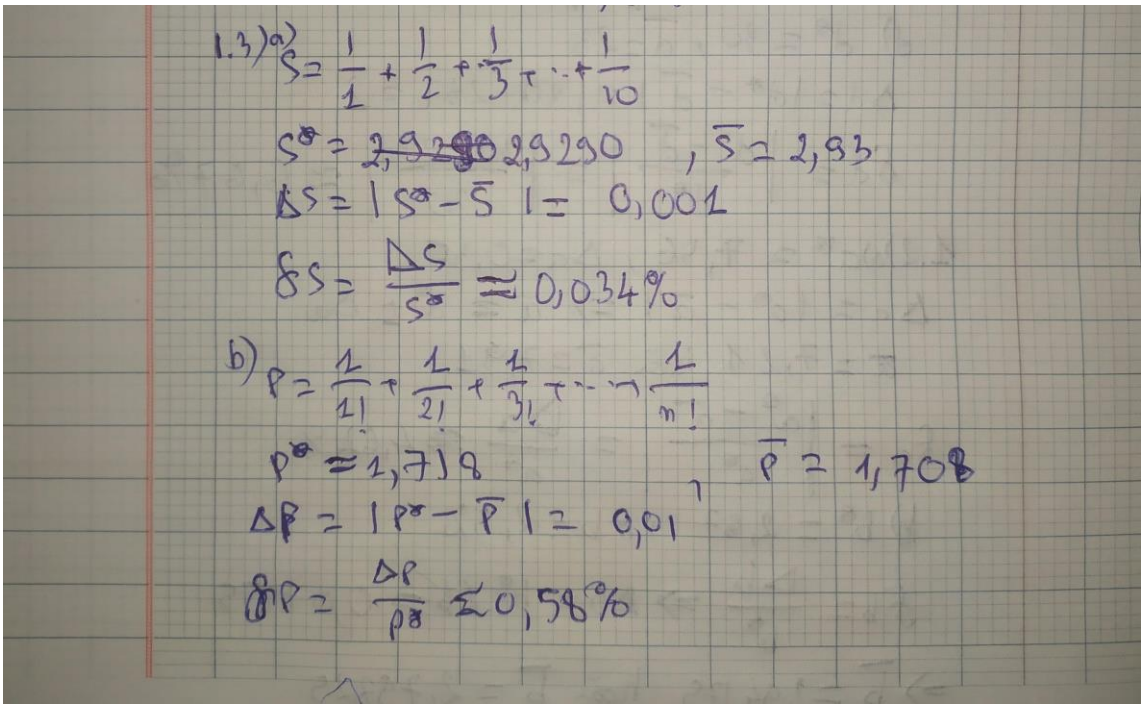
d) $\Delta d = 3,72$, $\delta d = 1,05\%$

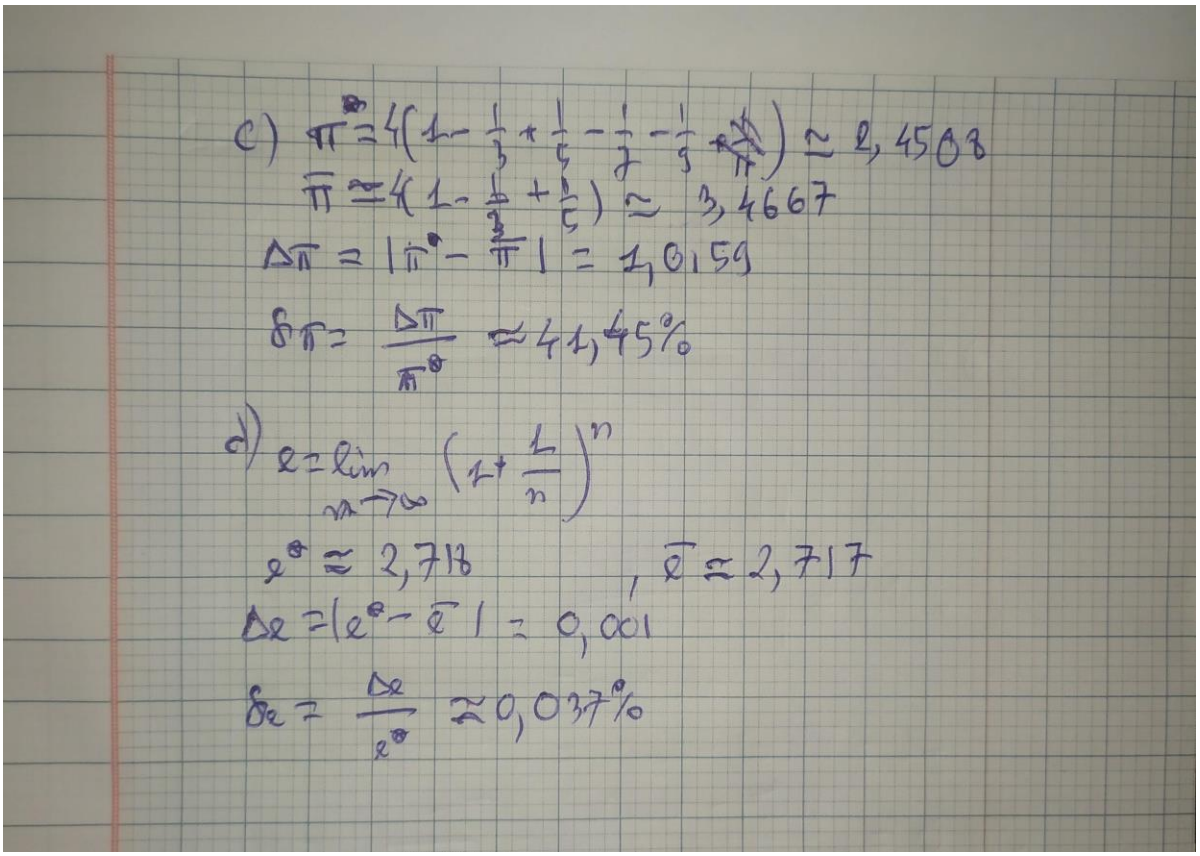
$\delta d = \frac{\Delta d}{d^*} \Rightarrow d^* = \frac{\Delta d}{\delta d} \approx 354,2857$

$\Rightarrow \begin{bmatrix} \bar{d} = 358,0057 \\ \bar{d} = 350,5657 \end{bmatrix}$

1.3

Lưu Đức Vũ - 19120433





Phan Đặng Diễm Uyên - 19120426

Bài 1.3a $\boldsymbol{S = \frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{10}}$

Ta có:

$$S^* = 2{,}9290, \qquad \overline{S} = 2{,}93$$

Sai số tuyệt đối

$$\Delta S = |S^* - \overline{S}| = |2{,}9290 - 2{,}93| = 0{,}001$$

Sai số tương đối

$$\delta S = \left|\frac{S^* - \overline{S}}{S^*}\right| = \left|\frac{2{,}9290 - 2{,}93}{2{,}9290}\right| = 0{,}003 = 0{,}3\%$$

Bài 1.3b $\boldsymbol{P = \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \cdots + \frac{1}{n!}}$

Ta có:

$$P^* = 1{,}7181, \qquad \overline{P} = 1{,}7083$$

Sai số tuyệt đối

$$\Delta P = |P^* - \overline{P}| = |1{,}7181 - 1{,}7083| = 0{,}0098$$

Sai số tương đối

$$\delta P = \left|\frac{P^* - \bar{P}}{P^*}\right| = \left|\frac{1{,}7181 - 1{,}7083}{1{,}7181}\right| = 0{,}0057 = 0{,}57\%$$

Bài 1.3c $\boldsymbol{\pi = 4\left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} + \cdots\right)}$

Ta có:

$$\pi^* = 3{,}3397, \qquad \bar{\pi} = 3{,}4667$$

Sai số tuyệt đối

$$\Delta\pi = |\pi^* - \bar{\pi}| = |3{,}3397 - 3{,}4667| = 0{,}127$$

Sai số tương đối

$$\delta\pi = \left|\frac{\pi^* - \bar{\pi}}{\pi^*}\right| = \left|\frac{3{,}3397 - 3{,}4667}{3{,}3397}\right| = 0{,}0380 = 3{,}80\%$$

Bài 1.3d $e = \lim\limits_{n\to\infty}\left(1+\frac{1}{n}\right)^n$

Ta có:

$$e^* = 2{,}7180, \qquad \bar{e} = 2{,}7169$$

Sai số tuyệt đối

$$\Delta e = |e^* - \bar{e}| = |2{,}7180 - 2{,}7169| = 0{,}0011$$

Sai số tương đối

$$\delta e = \left|\frac{e^* - \bar{e}}{e^*}\right| = \left|\frac{2{,}7180 - 2{,}7169}{2{,}7180}\right| = 0{,}0004 = 0{,}04\%$$

1.4

Đoàn Thu Ngân - 1920302

a)

$$A = ax + by^2 + \frac{z^3}{c}$$

$$A'_x = a, A'_y = 2b, A'_z = \frac{3z^2}{c}$$

$$\Delta A = a\Delta x + 2b\Delta y + \frac{3z^2}{c}\Delta c$$

$$\delta_A = \frac{\Delta A}{|A|} = \frac{a\Delta x + 2b\Delta y + \frac{3z^2}{c}\Delta c}{\left|ax + by^2 + \frac{z^3}{c}\right|}$$

b)

$$B = \frac{a+b}{x+y} + \frac{c}{z^2}$$

$$B'_x = \frac{-(a+b)}{(x+y)^2}, B'_y = \frac{-(a+b)}{(x+y)^2}, B'_c = \frac{-2c}{z^3}$$

$$\Delta B = \frac{-(a+b)}{(x+y)^2}\Delta x - \frac{(a+b)}{(x+y)^2}\Delta y - \frac{2c}{z^3}\Delta z$$

$$\delta_B = \frac{\Delta B}{|B|} = \frac{\frac{-(a+b)}{(x+y)^2}\Delta x - \frac{(a+b)}{(x+y)^2}\Delta y - \frac{2c}{z^3}\Delta z}{\frac{a+b}{x+y} + \frac{c}{z^2}}$$

c)

$$C = a\sin bx - y\cos cz$$

$$C'_x = ab\cos bx, C'_y = -\cos cz, C'_z = yc\sin cz$$

$$\Delta C = ab\cos bx\Delta x - \cos cz\Delta y + yc\sin cz\Delta z$$

$$\delta_C = \frac{\Delta C}{|C|} = \frac{ab\cos bx\Delta x - \cos cz\Delta y + yc\sin cz\Delta z}{a\sin bx - y\cos cz}$$

d)

$$D = \frac{ax + by + cz}{\sqrt{x^2 + y^2 + z^2}}$$

$$D'_x = \frac{a\sqrt{x^2 + y^2 + z^2} - \frac{ax^2}{\sqrt{x^2 + y^2 + z^2}}}{x^2 + y^2 + z^2} - \frac{bxy}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}} - \frac{cxz}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}}$$

$$= \frac{a(x^2 + y^2 + z^2) - ax^2 - bxy - cxz}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}}$$

$$D'_y = \frac{-axy}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}} + \frac{b\sqrt{x^2 + y^2 + z^2} - \frac{by^2}{\sqrt{x^2 + y^2 + z^2}}}{x^2 + y^2 + z^2} - \frac{cyz}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}}$$

$$= \frac{-axy + b(x^2 + y^2 + z^2) - by^2 - cyz}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}}$$

$$D'_z = \frac{-axz}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}} - \frac{bzy}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}} + \frac{c\sqrt{x^2 + y^2 + z^2} - \frac{cz^2}{\sqrt{x^2 + y^2 + z^2}}}{x^2 + y^2 + z^2}$$

$$= \frac{-axz - bzy + c(x^2 + y^2 + z^2) - cz^2}{x^2 + y^2 + z^2\sqrt{x^2 + y^2 + z^2}}$$

1.5

Đoàn Thế Huy - 19120079

1.5.

a) $u = -\ln(x_1 + x_2^2)$ $x_1 = 0,976$, $x_2 = 1,132$

$\Delta x_1 = \Delta x_2 = 0,5 \cdot 10^{-3} = 0,0005$

$u(0,976; 1,132) = -\ln(0,976 + 1,132^2) = 0,814$

$$\Delta u = \left|\frac{1}{x_1 + x_2^2}\right| \Delta x_1 + \left|\frac{2x_2}{x_1 + x_2^2}\right| \Delta x_2$$

$$= \left|\frac{1}{0,976 + 1,132^2}\right| 0,0005 + \left|\frac{2 \cdot 1,132}{0,976 + 1,132^2}\right| 0,0005$$

$$= 7,229 \cdot 10^{-4}$$

$$\delta u = \frac{\Delta u}{u} = \frac{7,229 \cdot 10^{-4}}{0,814} \approx 8,881 \cdot 10^{-4}$$

$$\approx 8,881 \cdot 10^{-2} \%$$

Date:

b) $u = ye^x + x^2 \quad x = 1,265 ; \; y = 1,493$

$\Delta x = \Delta y = 0,5 . 10^{-3} = 0,0005$

$u(1,265 ; 1,493) = 1,493 . e^{1,265} + 1,265^2$

$= 6,890$

$\Delta u = \left| ye^x + 2x \right| \Delta x + \left| e^x \right| \Delta y$

$= \left| 1,493 . e^{1,265} + 2 . 1,265 \right| 0,0005$

$+ \left| e^{1,265} \right| 0,0005$

$= 5,681 . 10^{-3}$

$\delta u = \frac{\Delta u}{u} = \frac{5,681 . 10^{-3}}{6,890} \approx 8,246 . 10^{-4}$

$\approx 0,08246 \%$

c) $u = x \sin y - xy \quad x = 0,095 \quad y = 2,643$

$\Delta x = \Delta y = 0,0005$

$u(0,095 ; 2,643) = 0,095 \sin(2,643) - 0,095 . 2,643$

$= -0,247$

$\Delta u = \left| \sin y - y \right| \Delta x + \left| x \cos y - x \right| \Delta y$

$= \left| \sin 2,643 - 2,643 \right| 0,0005 + \left| 0,095 . \cos 2,643 - 0,095 \right| 0,0005$

$= 1,298 . 10^{-3}$

$\delta u = \frac{\Delta u}{|u|} = \frac{1,298 . 10^{-3}}{0,247} = 5,255 . 10^{-3}$

$= 0,5255 \%$

Date:

d) $u = \dfrac{x + \cos x}{1 + y}$ $\quad x = -0,693 \; ; \; y = -0,386$

$\Delta x = \Delta y = 0,0005$

$u(-0,693 ; -0,386) = \dfrac{-0,693 + \cos(-0,693)}{1 - 0,386} = 0,500$

$$\Delta u = \left|\frac{1 - \sin x}{1 + y}\right| \Delta x + \left|\frac{x + \cos x}{(1+y)^2}\right| \Delta y$$

$$= \left|\frac{1 - \sin(-0,693)}{1 - 0,386}\right| 0,0005 + \left|\frac{-0,693 + \cos(-0,693)}{(1 - 0,386)^2}\right| 0,0005$$

$$= 9,041 . 10^{-4}$$

$$\delta_u = \frac{\Delta u}{|u|} = \frac{9,041 . 10^{-4}}{0,5} = 1,808 . 10^{-3}$$

$$= 0,1808\%$$

1.6

Hà Bảo Khang – 19120252

1.6/ a) Diện tích hình tròn: $S = \pi.r^2 = \pi.\left(\frac{d}{2}\right)^2 = 177241\pi(mm^2)$

$d = 2r = 0{,}842 \pm 0{,}001(m)$

$\Delta d = 1mm$

Ta có: $\Delta S = \frac{\pi}{4}.2d.\Delta d = \frac{\pi}{2}.842.1 = 421\,\pi(mm^2)$

Diện tích hình tròn: $S \pm \Delta S = 177241\pi + 421\,\pi(mm^2)$

b) $a = 27°5'18'', \Delta a = 0°0'1''$

Đặt A $= sina = 0{,}4554$

$\Delta A = cosa.\Delta a = 2{,}473\,.\,10^{-4}$

Vậy $A \pm \Delta A = 0{,}4554 + 2{,}473\,.\,10^{-4}$

c)Ta có: $V = \pi R^2 h$

$\Delta V = \pi R^2.\Delta h + 2\pi Rh.\Delta R$

d) $a = 5 \pm 0{,}2, b = 3 \pm 0{,}1, c = 2{,}5 \pm 0{,}15$

i) $S_{đáy} = a.b = 5.3 = 15(m^2), \Delta S_{đáy} = b.\Delta a + a.\Delta b = 3.0{,}1 + 5.0{,}2 = 1{,}3(m^2)$

=> Diện tích mặt đáy: $S_{đáy} \pm \Delta S_{đáy} = 15 + 1{,}3(m^2)$

ii) $S_{mặt\ bên} = 2ac + 2bc = 40(m^2)$,

$\Delta S_{mặt\ bên} = 2c\Delta a + 2c\Delta b + (2a + 2b).\Delta c = 3.9(m^2)$

=> Diện tích mặt bên: $S_{mặt\ bên} \pm \Delta S_{mặt\ bên} = 40 + 3{,}9(m^2)$

iii) $S_{tp} = 2S_{\text{đáy}} + S_{\text{mặt bên}} = 2ab + 2ac + 2bc = 70(m^2)$

$\Delta S_{tp} = 2(b + c).\Delta a + 2(a + c).\Delta b + 2(b + c)\Delta c = 6.1(m^2)$

$=>$ Diện tích toàn phần: $S_{tp} \pm \Delta S_{tp} = 70 + 6.1(m^2)$

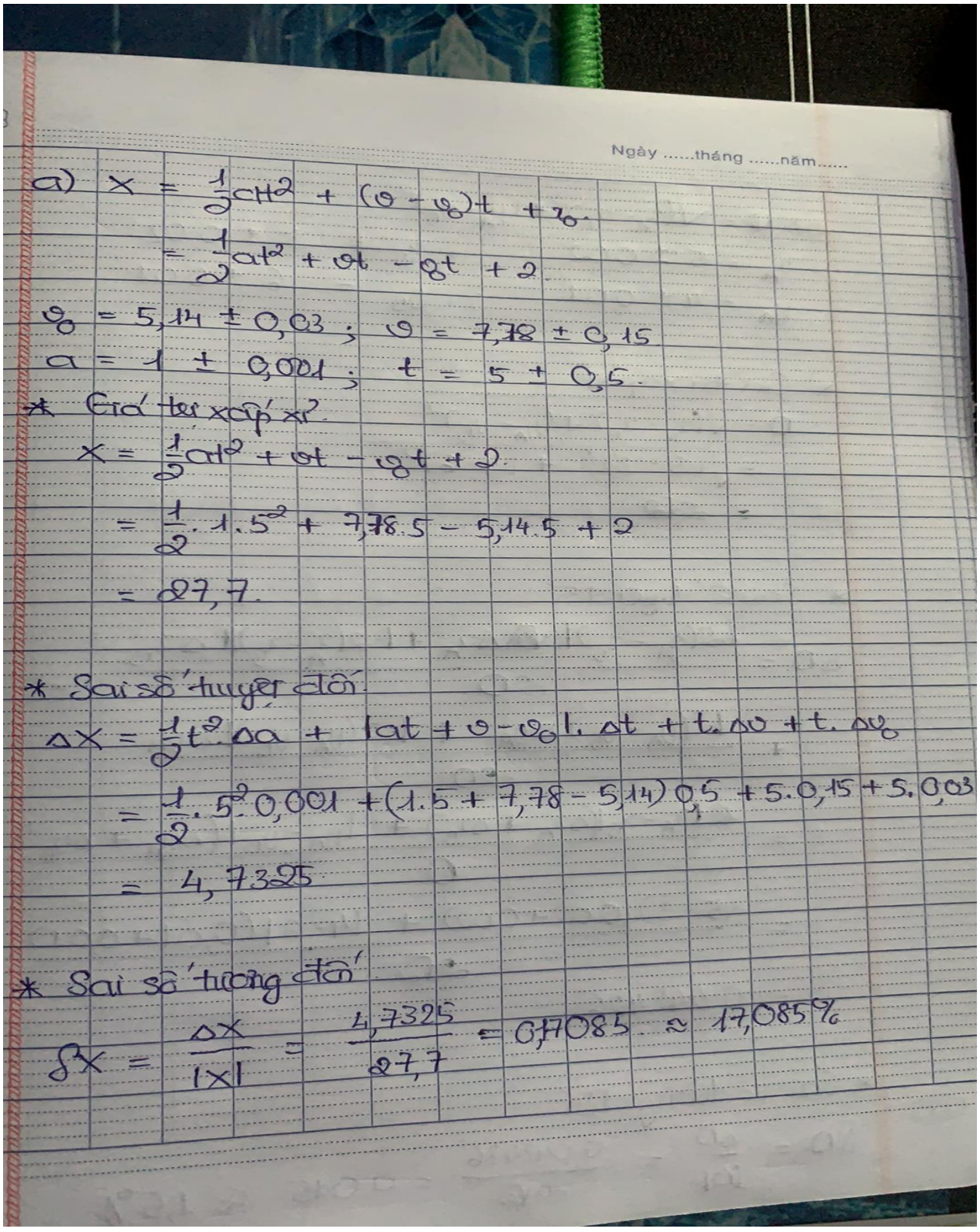
iv) $V = abc = 37.5(m^2)$

$\Delta V = bc.\Delta a + ac.\Delta b + ab.\Delta c = 5(m^3)$

$=>$ Thể tích hình hộp: $V \pm \Delta V = 37.5 + 5(m^2)$

1.7

Trần Vũ Việt Cường – 19120465



Ngày .....tháng .....năm.....

a) $x = \frac{1}{2}at^2 + (v - v_0)t + x_0$

$= \frac{1}{2}at^2 + vt - v_0t + 2$

$v_0 = 5,14 \pm 0,03$; $v = 7,78 \pm 0,15$

$a = 1 \pm 0,001$; $t = 5 \pm 0,5$.

* Giá trị xấp xỉ:

$x = \frac{1}{2}at^2 + vt - v_0t + 2$

$= \frac{1}{2} \cdot 1 \cdot 5^2 + 7,78 \cdot 5 - 5,14 \cdot 5 + 2$

$= 27,7$.

* Sai số tuyệt đối:

$\Delta x = \frac{1}{2}t^2 \cdot \Delta a + |at + v - v_0| \cdot \Delta t + t \cdot \Delta v + t \cdot \Delta v_0$

$= \frac{1}{2} \cdot 5^2 \cdot 0,001 + (1 \cdot 5 + 7,78 - 5,14) \cdot 0,5 + 5 \cdot 0,15 + 5 \cdot 0,03$

$= 4,7325$

* Sai số tương đối:

$\delta x = \frac{\Delta x}{|x|} = \frac{4,7325}{27,7} = 0,17085 \approx 17,085\%$

Ngày .....tháng .....năm.....

b) $F = G\frac{m_1 m_2}{x^2}$; $G = 6,78 \pm 0,01$

$m_1 = 12,67 \pm 0,01$

$m_2 = 1 \pm 0,01$

$x = 2,48 \pm 0,02$

* Giá trị xấp xỉ:

$F = G\frac{m_1 m_2}{x^2} = 6,78 \cdot \frac{12,67 \cdot 1}{2,48^2} = 13,96699 \approx 13,967$

* Sai số tuyệt đối

$\Delta F = \frac{m_1 \cdot m_2}{x^2} \cdot \Delta G + \frac{G \cdot m_2}{x^2} \cdot \Delta m_1 + \frac{G \cdot m_1}{x^2} \cdot \Delta m_2 + G \cdot m_1 m_2 \cdot \frac{2\Delta x}{x^3}$

$= \frac{12,67 \cdot 1}{2,48^2} \cdot 0,01 + \frac{6,78 \cdot 1}{2,48^2} \cdot 0,01 + \frac{6,78 \cdot 12,67}{2,48^2} \cdot 0,01 +$

$6,78 \cdot 12,67 \cdot 1 \cdot \frac{2 \cdot 0,02}{2,48^3}$

$\approx 0,39657$

* Sai số tương đối:

$\delta F = \frac{\Delta F}{|F|} = \frac{0,39657}{13,967} = 0,02839... \approx 2,84\ \%$

Ngày .....tháng .....năm.....

c) $D = \sqrt{(x_A - x_B)^2 + (y_A - y_B)^2}$

$x_A = 5 \pm 0,02$; $x_B = 3 \pm 0,02$

$y_A = 4 \pm 0,01$; $y_B = 6 \pm 0,01$

* Giá trị xấp xỉ

$D = \sqrt{(x_A - x_B)^2 + (y_A - y_B)^2}$

$= \sqrt{(5-3)^2 + (4-6)^2}$

$= 2\sqrt{2}$.

* Sai số tuyệt đối

$$\Delta D = \frac{|2(x_A - x_B)| \cdot \Delta x_A + |-2(x_A - x_B)| \Delta x_B}{2D} + \frac{|2(y_A - y_B)| \Delta y_A + |-2(y_A - y_B)| \Delta y_B}{2D}$$

$$= \frac{|x_A - x_B|(\Delta x_A + \Delta x_B) + |y_A - y_B|(\Delta y_A + \Delta y_B)}{D}$$

$$= \frac{(5-3)(0,02+0,02) + |4-6|(0,01+0,01)}{2\sqrt{2}}$$

$= 0,042426$.

* Sai số tương đối

$$\delta D = \frac{\Delta D}{|D|} = \frac{0,042426}{2\sqrt{2}} = 0,015 \approx 1,5\%$$

Ngày .....tháng .....năm.....

d) $E = \frac{1}{2}mv^2 + mgh$

$m = 1 \pm 0,05$; $v = 5 \pm 0,1$; $g = 9,82 \pm 0,03$; $h = 2 \pm 0,05$

* Giá trị trực tiếp:

$E = \frac{1}{2}mv^2 + mgh = \frac{1}{2} \cdot 1 \cdot 5^2 + 1 \cdot 9,82 \cdot 2 = 32,14$

* Sai số tuyệt đối:

$\Delta E = |\frac{1}{2}v^2| \cdot \Delta g + |gh| \cdot \Delta m + |mv| \cdot \Delta v + |mh| \cdot \Delta g + |mg| \cdot \Delta h$

$= |\frac{1}{2} \cdot 5^2| + 9,82 \cdot 1 \cdot 0,05 + |1 \cdot 5| \cdot 0,1$

$+ |1 \cdot 2| \cdot 0,03 + |1 \cdot 9,82| \cdot 0,05$

$= 2,17682$

* Sai số tương đối:

$\delta E = \frac{\Delta E}{|E|} = \frac{2,17682}{32,14} = 0,06773 \approx 6,773\%$

1.8

Đinh Huỳnh Tiến Phú - 19120325

a) Phần trăm lấy thêm trên hóa đơn:
(500000-369700-130000)/369700= 0.0008= 0.08%

b) Giả sử trả lại 100000, người đó đã lấy:
500000-369700-100000=30300 (đ)

Tương đương với: 30300/369700=0.082= 8,2%

Vậy có thể chấp nhận

1.9

Huỳnh Tấn Thọ - 19120383

Bài 1.9

Theo đề:

$$m = 100g \pm 2\% \Rightarrow m = 100g = 0{,}1kg;\ \Delta m = 0{,}002$$

$$T = 2s \pm 1\% \Rightarrow T = 2s;\ \Delta T = 0{,}02$$

Ta có: $T = 2\pi\sqrt{\frac{m}{k}} \Rightarrow k = \frac{4\pi^2 m}{T^2} \Rightarrow \delta k = \frac{\Delta k}{|k|} = \left(\left|\frac{\partial f}{\partial m}\right|\Delta m + \left|\frac{\partial f}{\partial T}\right|\Delta T\right) \div \left(\frac{4\pi^2 m}{T^2}\right)$

$$= \left(\frac{4\pi^2}{T^2}\Delta m + \frac{2 \times 4\pi^2 m}{T^3}\Delta T\right) \div \left(\frac{4\pi^2 m}{T^2}\right) = \left(\frac{4\pi^2}{2^2}0{,}002 + \frac{8\pi^2 0{,}1}{2^3}0{,}02\right) \div \left(\frac{4\pi^2 0{,}1}{2^2}\right) = \frac{1}{25} = 0{,}04$$

Vậy sai số tương đối của phép đo là 4%

1.10

Trần Thái Bảo – 19120458

Theo đề ta có:

$$U^2 = Uc^2 + Ur^2$$

$$U = \sqrt{(Uc^2 + Ur^2)}$$

$$=> \Delta U = \frac{Uc*\Delta Uc + Ur*\Delta Ur}{\sqrt{Uc^2+Ur^2}}$$

$$Ur = 14 \pm 1.0(V)\ ;\ Uc = 48 \pm 1.0(V)$$

$$=> \Delta Ur = 1.0(V);\ \Delta Uc = 1.0(V)$$

Sai số tương đối: $\Delta U = \frac{48*1+14*1}{\sqrt{48^2+14^2}} = 1.24(V)$

Sai số tuyệt đối: $\delta U = \frac{\Delta U}{|U|} = \frac{1.24}{50} = 0.0248 = 2.48\%$

Vậy $U = 50 \pm 1.24\ (V)$

1.11

Trần Thái Bảo - 19120458

Theo đề ta có:

$$\frac{L}{n} = \frac{\lambda D}{a} => \lambda = \frac{La}{nD}$$

$$=> \Delta\lambda = \frac{L*\Delta a}{nD} + \frac{a*\Delta L}{nD} + \frac{-La*\Delta D}{nD^2}$$

$$a = 1.20 \pm 0.03(mm); D = 160 \pm 5(mm)$$

$$n = 10; L = 8.0 \pm 0.16(mm)$$

$$=> \Delta a = 0.03(mm); \Delta D = 5(mm); \Delta L = 0.16(mm)$$

$$Sai\ số\ tương\ đối: \Delta L = \frac{8*0.03}{10*160} + \frac{1.2*0.16}{10*160} + \frac{-8*1.2*5}{10*160^2} = 8.25 * 10^{-5}(mm)$$

$$Sai\ số\ tuyệt\ đối: \delta L = \frac{\Delta L}{|L|} = \frac{8.25*10^{-5}}{8} = 1.03125 * 10^{-3}\ \%$$

Vậy $L = 6 * 10^{-3} \pm 8.25 * 10^{-5}$