

Контрольная работа №1 (часть 2)

Задача 1. Написать разложение вектора \bar{x} по векторам \bar{p} , \bar{q} , \bar{r} .

Задача 2. Коллинеарны ли векторы \bar{c}_1 и \bar{c}_2 , построенные по векторам \bar{a} и \bar{b} .

Задача 3. Найти косинус угла между векторами \overline{AB} и \overline{AC} .

Задача 4. Вычислить площадь параллелограмма, построенного на векторах \bar{a} и \bar{b} .

Задача 5. Компланарны ли вектора \bar{a} , \bar{b} и \bar{c} .

Задача 6. Вычислить объём тетраэдра с вершинами в точках A_1 , A_2 , A_3 , A_4 и его высоту, опущенную из вершины A_4 на грань $A_1A_2A_3$.

Вариант №1.

1. $\bar{x} = \{-2, 4, 7\}$; $\bar{p} = \{0, 1, 2\}$; $\bar{q} = \{1, 0, 1\}$; $\bar{r} = \{-1, 2, 4\}$.

2. $\bar{a} = \{1, -2, 3\}$; $\bar{b} = \{3, 0, -1\}$; $\bar{c}_1 = 2 \cdot \bar{a} + 4 \cdot \bar{b}$; $\bar{c}_2 = -\bar{a} + 3 \cdot \bar{b}$.

3. $A(1, -2, 3)$; $B(0, -1, 2)$; $C(3, -4, 5)$.

4. $\bar{a} = \bar{p} + 2 \cdot \bar{q}$, $\bar{b} = 3 \cdot \bar{p} - \bar{q}$, $|\bar{p}| = 1$, $|\bar{q}| = 2$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{6}$.

5. $\bar{a} = \{2, 3, 1\}$; $\bar{b} = \{-1, 0, -1\}$; $\bar{c} = \{2, 2, 2\}$.

6. $A_1(1, 3, 6)$; $A_2(2, 2, 1)$; $A_3(-1, 0, 1)$; $A_4(-4, 6, -3)$.

Вариант №2.

1. $\bar{x} = \{6, 12, -1\}$; $\bar{p} = \{1, 3, 0\}$; $\bar{q} = \{2, -1, 1\}$; $\bar{r} = \{0, -1, 2\}$.

2. $\bar{a} = \{1, 0, 1\}$; $\bar{b} = \{-2, 3, 5\}$; $\bar{c}_1 = \bar{a} + 2 \cdot \bar{b}$; $\bar{c}_2 = 3 \cdot \bar{a} - \bar{b}$.

3. $A(0, -3, 6)$; $B(-12, -3, -3)$; $C(-9, -3, -6)$.

4. $\bar{a} = 3 \cdot \bar{p} + 2 \cdot \bar{q}$, $\bar{b} = \bar{p} - 2 \cdot \bar{q}$, $|\bar{p}| = 4$, $|\bar{q}| = 1$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{4}$.

5. $\bar{a} = \{3, 2, 1\}$; $\bar{b} = \{2, 3, 4\}$; $\bar{c} = \{3, 1, -1\}$.

6. $A_1(-4, 2, 6)$; $A_2(2, -3, 0)$; $A_3(-10, 5, 8)$; $A_4(-5, 2, -4)$.

Вариант №3.

1. $\bar{x} = \{1, -4, 4\}$; $\bar{p} = \{2, 1, -1\}$; $\bar{q} = \{0, 3, 2\}$; $\bar{r} = \{1, -1, 1\}$.

2. $\bar{a} = \{-2, 4, 1\}$; $\bar{b} = \{1, -2, 7\}$; $\bar{c}_1 = 5 \cdot \bar{a} + 3 \cdot \bar{b}$; $\bar{c}_2 = 2 \cdot \bar{a} - \bar{b}$.

3. $A(3, 3, -1)$; $B(5, 5, -2)$; $C(4, 1, 1)$.

$$4. \bar{a} = \bar{p} - 3 \cdot \bar{q}, \bar{b} = \bar{p} + 2 \cdot \bar{q}, |\bar{p}| = \frac{1}{5}, |\bar{q}| = 1, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{2}.$$

$$5. \bar{a} = \{1, 5, 2\}; \bar{b} = \{-1, 1, -1\}; \bar{c} = \{1, 1, 1\}.$$

$$6. A_1(7, 2, 4); A_2(7, -1, -2); A_3(3, 3, 1); A_4(-4, 2, 1).$$

Вариант №4.

$$1. \bar{x} = \{-9, 5, 5\}; \bar{p} = \{4, 1, 1\}; \bar{q} = \{2, 0, -3\}; \bar{r} = \{-1, 2, 1\}.$$

$$2. \bar{a} = \{1, 2, -3\}; \bar{b} = \{2, -1, -1\}; \bar{c}_1 = 4 \cdot \bar{a} + 3 \cdot \bar{b}; \bar{c}_2 = 8 \cdot \bar{a} - \bar{b}.$$

$$3. A(-1, 2, -3); B(3, 4, -6); C(1, 1, -1).$$

$$4. \bar{a} = 3 \cdot \bar{p} - 2 \cdot \bar{q}, \bar{b} = \bar{p} + 5 \cdot \bar{q}, |\bar{p}| = 4, |\bar{q}| = \frac{1}{2}, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{6}.$$

$$5. \bar{a} = \{1, -1, -3\}; \bar{b} = \{3, 2, 1\}; \bar{c} = \{2, 3, 4\}.$$

$$6. A_1(2, 1, 4); A_2(-1, 5, -2); A_3(-7, -3, 2); A_4(-6, -3, 6).$$

Вариант №5.

$$1. \bar{x} = \{-5, -5, 5\}; \bar{p} = \{-2, 0, 1\}; \bar{q} = \{1, 3, -1\}; \bar{r} = \{0, 4, 1\}.$$

$$2. \bar{a} = \{3, 5, 4\}; \bar{b} = \{5, 9, 7\}; \bar{c}_1 = -2 \cdot \bar{a} + \bar{b}; \bar{c}_2 = 3 \cdot \bar{a} - 2 \cdot \bar{b}.$$

$$3. A(-4, -2, 0); B(-1, -2, 4); C(3, -2, 1).$$

$$4. \bar{a} = \bar{p} - 2 \cdot \bar{q}, \bar{b} = 2 \cdot \bar{p} + \bar{q}, |\bar{p}| = 2, |\bar{q}| = 3, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{3 \cdot \pi}{4}.$$

$$5. \bar{a} = \{3, 3, 1\}; \bar{b} = \{1, -2, 1\}; \bar{c} = \{1, 1, 1\}.$$

$$6. A_1(-1, -5, 2); A_2(-6, 0, -3); A_3(3, 6, -3); A_4(10, 6, 7).$$

Вариант №6.

$$1. \bar{x} = \{13, 2, 7\}; \bar{p} = \{5, 1, 0\}; \bar{q} = \{2, -1, 3\}; \bar{r} = \{1, 0, -1\}.$$

$$2. \bar{a} = \{1, 4, -2\}; \bar{b} = \{1, 1, -1\}; \bar{c}_1 = \bar{a} + \bar{b}; \bar{c}_2 = 4 \cdot \bar{a} + 2 \cdot \bar{b}.$$

$$3. A(5, 3, -1); B(5, 2, 0); C(6, 4, -1).$$

$$4. \bar{a} = \bar{p} + 3 \cdot \bar{q}, \bar{b} = \bar{p} - 2 \cdot \bar{q}, |\bar{p}| = 2, |\bar{q}| = 3, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{3}.$$

$$5. \bar{a} = \{3, 1, -1\}; \bar{b} = \{-2, -1, 0\}; \bar{c} = \{5, 2, -1\}.$$

$$6. A_1(0, -1, -1); A_2(-2, 3, 5); A_3(1, -5, -9); A_4(-1, -6, 3).$$

Вариант №7.

1. $\bar{x} = \{-19, -1, 7\}$; $\bar{p} = \{0, 1, 1\}$; $\bar{q} = \{-2, 0, 1\}$; $\bar{r} = \{3, 1, 0\}$.
2. $\bar{a} = \{1, -2, 5\}$; $\bar{b} = \{3, -1, 0\}$; $\bar{c}_1 = 4 \cdot \bar{a} - 2 \cdot \bar{b}$; $\bar{c}_2 = -2 \cdot \bar{a} + \bar{b}$.
3. $A(-3, -7, -5)$; $B(0, -1, -2)$; $C(2, 3, 0)$.
4. $\bar{a} = 2 \cdot \bar{p} - \bar{q}$, $\bar{b} = \bar{p} + 3 \cdot \bar{q}$, $|\bar{p}| = 3$, $|\bar{q}| = 2$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{2}$.
5. $\bar{a} = \{4, 3, 1\}$; $\bar{b} = \{1, -2, 1\}$; $\bar{c} = \{2, 2, 2\}$.
6. $A_1(5, 2, 0)$; $A_2(2, 5, 0)$; $A_3(1, 2, 4)$; $A_4(-1, 1, 1)$.

Вариант №8.

1. $\bar{x} = \{3, -3, 4\}$; $\bar{p} = \{1, 0, 2\}$; $\bar{q} = \{0, 1, 1\}$; $\bar{r} = \{2, -1, 4\}$.
2. $\bar{a} = \{3, 4, -1\}$; $\bar{b} = \{2, -1, 1\}$; $\bar{c}_1 = 6 \cdot \bar{a} - 3 \cdot \bar{b}$; $\bar{c}_2 = -2 \cdot \bar{a} + \bar{b}$.
3. $A(2, -4, 6)$; $B(0, -2, 4)$; $C(6, -8, 10)$.
4. $\bar{a} = 4 \cdot \bar{p} + \bar{q}$, $\bar{b} = \bar{p} - \bar{q}$, $|\bar{p}| = 7$, $|\bar{q}| = 2$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{4}$.
5. $\bar{a} = \{4, 3, 1\}$; $\bar{b} = \{6, 7, 4\}$; $\bar{c} = \{2, 0, -1\}$.
6. $A_1(2, -1, -2)$; $A_2(1, 2, 1)$; $A_3(5, 0, -6)$; $A_4(-10, 9, -7)$.

Вариант №9.

1. $\bar{x} = \{3, 3, -1\}$; $\bar{p} = \{3, 1, 0\}$; $\bar{q} = \{-1, 2, 1\}$; $\bar{r} = \{-1, 0, 2\}$.
2. $\bar{a} = \{-2, -3, -2\}$; $\bar{b} = \{1, 0, 5\}$; $\bar{c}_1 = 3 \cdot \bar{a} + 9 \cdot \bar{b}$; $\bar{c}_2 = -\bar{a} - 3 \cdot \bar{b}$.
3. $A(0, 1, -2)$; $B(3, 1, 2)$; $C(4, 1, 1)$.
4. $\bar{a} = \bar{p} - 4 \cdot \bar{q}$, $\bar{b} = 3 \cdot \bar{p} + \bar{q}$, $|\bar{p}| = 1$, $|\bar{q}| = 2$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{6}$.
5. $\bar{a} = \{3, 2, 1\}$; $\bar{b} = \{1, -3, -7\}$; $\bar{c} = \{1, 2, 3\}$.
6. $A_1(-2, 0, -4)$; $A_2(-1, 7, 1)$; $A_3(4, -8, -4)$; $A_4(1, -4, 6)$.

Вариант №10.

1. $\bar{x} = \{-1, 7, -4\}$; $\bar{p} = \{-1, 2, 1\}$; $\bar{q} = \{2, 0, 3\}$; $\bar{r} = \{1, 1, -1\}$.
2. $\bar{a} = \{-1, 4, 2\}$; $\bar{b} = \{3, -2, 6\}$; $\bar{c}_1 = 2 \cdot \bar{a} - \bar{b}$; $\bar{c}_2 = -6 \cdot \bar{a} + 3 \cdot \bar{b}$.
3. $A(3, 2, -1)$; $B(1, 5, -2)$; $C(4, 1, 1)$.

$$4. a = \bar{p} + 4 \cdot \bar{q}, \bar{b} = 2 \cdot \bar{p} - \bar{q}, |\bar{p}| = 7, |\bar{q}| = 2, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{3}.$$

$$5. \bar{a} = \{3, 7, 2\}; \bar{b} = \{-2, 0, -1\}; \bar{c} = \{2, 2, 1\}.$$

$$6. A_1(14, 4, 5); A_2(-5, -3, 2); A_3(-2, -6, -3); A_4(-2, 2, -1).$$

Вариант №11.

$$1. \bar{x} = \{6, 5, -14\}; \bar{p} = \{1, 1, 4\}; \bar{q} = \{0, -3, 2\}; \bar{r} = \{2, 1, -1\}.$$

$$2. \bar{a} = \{5, 0, -1\}; \bar{b} = \{7, 2, 3\}; \bar{c}_1 = 2 \cdot \bar{a} - \bar{b}; \bar{c}_2 = -6 \cdot \bar{a} + 3 \cdot \bar{b}.$$

$$3. A(2, 1, -1); B(6, -1, -4); C(4, 2, 1).$$

$$4. \bar{a} = 3 \cdot \bar{p} + 2 \cdot \bar{q}, \bar{b} = \bar{p} - \bar{q}, |\bar{p}| = 10, |\bar{q}| = 1, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{2}.$$

$$5. \bar{a} = \{1, -2, 6\}; \bar{b} = \{1, 0, 1\}; \bar{c} = \{2, -6, 17\}.$$

$$6. A_1(1, 2, 0); A_2(3, 0, -3); A_3(5, 2, 6); A_4(8, 4, -9).$$

Вариант №12.

$$1. \bar{x} = \{6, -1, 7\}; \bar{p} = \{1, -2, 0\}; \bar{q} = \{-1, 1, 3\}; \bar{r} = \{1, 0, 4\}.$$

$$2. \bar{a} = \{0, 3, -2\}; \bar{b} = \{1, -2, 1\}; \bar{c}_1 = 5 \cdot \bar{a} - 2 \cdot \bar{b}; \bar{c}_2 = 3 \cdot \bar{a} + 5 \cdot \bar{b}.$$

$$3. A(-1, -2, 1); B(-4, -2, 5); C(-8, -2, 2).$$

$$4. \bar{a} = 4 \cdot \bar{p} - \bar{q}, \bar{b} = \bar{p} + 2 \cdot \bar{q}, |\bar{p}| = 5, |\bar{q}| = 4, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{4}.$$

$$5. \bar{a} = \{6, 3, 4\}; \bar{b} = \{-1, -2, -1\}; \bar{c} = \{2, 1, 2\}.$$

$$6. A_1(2, -1, 2); A_2(1, 2, -1); A_3(3, 2, 1); A_4(-4, 2, 5).$$

Вариант №13.

$$1. \bar{x} = \{5, 15, 0\}; \bar{p} = \{1, 0, 5\}; \bar{q} = \{-1, 3, 2\}; \bar{r} = \{0, -1, 1\}.$$

$$2. \bar{a} = \{-2, 7, -1\}; \bar{b} = \{-3, 5, 2\}; \bar{c}_1 = 2 \cdot \bar{a} + 3 \cdot \bar{b}; \bar{c}_2 = 3 \cdot \bar{a} + 2 \cdot \bar{b}.$$

$$3. A(6, 2, -3); B(6, 3, -2); C(7, 3, -3).$$

$$4. \bar{a} = 2 \cdot \bar{p} + 3 \cdot \bar{q}, \bar{b} = \bar{p} - 2 \cdot \bar{q}, |\bar{p}| = 6, |\bar{q}| = 7, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{3}.$$

$$5. \bar{a} = \{7, 3, 4\}; \bar{b} = \{-1, -2, -1\}; \bar{c} = \{4, 2, 4\}.$$

$$6. A_1(1, 1, 2); A_2(-1, 1, 3); A_3(2, -2, 4); A_4(-1, 0, -2).$$

Вариант №14.

1. $\bar{x} = \{2, -1, 11\}$; $\bar{p} = \{1, 1, 0\}$; $\bar{q} = \{0, 1, -2\}$; $\bar{r} = \{1, 0, 3\}$.
2. $\bar{a} = \{3, 7, 0\}$; $\bar{b} = \{1, -3, 4\}$; $\bar{c}_1 = 4 \cdot \bar{a} - 2 \cdot \bar{b}$; $\bar{c}_2 = -2 \cdot \bar{a} + \bar{b}$.
3. $A(0, 0, 4)$; $B(-3, -6, 1)$; $C(-5, -10, -1)$.
4. $\bar{a} = 3 \cdot \bar{p} - \bar{q}$, $\bar{b} = \bar{p} - 2 \cdot \bar{q}$, $|\bar{p}| = 3$, $|\bar{q}| = 4$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{3}$.
5. $\bar{a} = \{2, 3, 2\}$; $\bar{b} = \{4, 7, 5\}$; $\bar{c} = \{2, 0, -1\}$.
6. $A_1(2, 3, 1)$; $A_2(4, 1, -2)$; $A_3(6, 3, 7)$; $A_4(7, 5, -3)$.

Вариант №15.

1. $\bar{x} = \{11, 5, -3\}$; $\bar{p} = \{1, 0, 2\}$; $\bar{q} = \{-1, 0, 1\}$; $\bar{r} = \{2, 5, -3\}$.
2. $\bar{a} = \{-1, 2, -1\}$; $\bar{b} = \{2, -7, 1\}$; $\bar{c}_1 = 6 \cdot \bar{a} - 2 \cdot \bar{b}$; $\bar{c}_2 = -3 \cdot \bar{a} + \bar{b}$.
3. $A(2, -8, -1)$; $B(4, -6, 0)$; $C(-2, -5, -1)$.
4. $\bar{a} = 2 \cdot \bar{p} + 3 \cdot \bar{q}$, $\bar{b} = \bar{p} - 2 \cdot \bar{q}$, $|\bar{p}| = 2$, $|\bar{q}| = 3$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{4}$.
5. $\bar{a} = \{5, 3, 4\}$; $\bar{b} = \{-1, 0, -1\}$; $\bar{c} = \{4, 2, 4\}$.
6. $A_1(1, 1, -1)$; $A_2(2, 3, 1)$; $A_3(3, 2, 1)$; $A_4(5, 9, -8)$.

Вариант №16.

1. $\bar{x} = \{8, 0, 5\}$; $\bar{p} = \{2, 0, 1\}$; $\bar{q} = \{1, 1, 0\}$; $\bar{r} = \{4, 1, 2\}$.
2. $\bar{a} = \{7, 9, -2\}$; $\bar{b} = \{5, 4, 3\}$; $\bar{c}_1 = 4 \cdot \bar{a} - \bar{b}$; $\bar{c}_2 = -\bar{a} + 4 \cdot \bar{b}$.
3. $A(3, -6, 9)$; $B(0, -3, 6)$; $C(9, -12, 15)$.
4. $\bar{a} = 2 \cdot \bar{p} - 3 \cdot \bar{q}$, $\bar{b} = 3 \cdot \bar{p} + \bar{q}$, $|\bar{p}| = 4$, $|\bar{q}| = 1$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{6}$.
5. $\bar{a} = \{3, 10, 5\}$; $\bar{b} = \{-2, -2, -3\}$; $\bar{c} = \{2, 4, 3\}$.
6. $A_1(1, 5, -7)$; $A_2(-3, 6, 3)$; $A_3(-2, 7, 3)$; $A_4(-4, 8, -12)$.

Вариант №17.

1. $\bar{x} = \{3, 1, 8\}$; $\bar{p} = \{0, 1, 3\}$; $\bar{q} = \{1, 2, -1\}$; $\bar{r} = \{2, 0, -1\}$.
2. $\bar{a} = \{5, 0, -2\}$; $\bar{b} = \{6, 4, 3\}$; $\bar{c}_1 = 5 \cdot \bar{a} + 3 \cdot \bar{b}$; $\bar{c}_2 = -10 \cdot \bar{a} + 6 \cdot \bar{b}$.
3. $A(0, 2, -4)$; $B(8, 2, 2)$; $C(6, 2, 4)$.

$$4. \bar{a} = 5 \cdot \bar{p} + \bar{q}, \bar{b} = \bar{p} - 3 \cdot \bar{q}, |\bar{p}| = 1, |\bar{q}| = 2, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{3}.$$

$$5. \bar{a} = \{-2, -4, -3\}; \bar{b} = \{4, 3, 1\}; \bar{c} = \{6, 7, 4\}.$$

$$6. A_1(-3, 4, -7); A_2(1, 5, -4); A_3(-5, -2, 0); A_4(2, 5, 4).$$

Вариант №18.

$$1. \bar{x} = \{8, 1, 12\}; \bar{p} = \{1, 2, -1\}; \bar{q} = \{3, 0, 2\}; \bar{r} = \{-1, 1, 1\}.$$

$$2. \bar{a} = \{8, 3, -1\}; \bar{b} = \{4, 1, 3\}; \bar{c}_1 = 2 \cdot \bar{a} - \bar{b}; \bar{c}_2 = -4 \cdot \bar{a} + 2 \cdot \bar{b}.$$

$$3. A(3, 3, -1); B(5, 1, -2); C(4, 1, 1).$$

$$4. \bar{a} = 7 \cdot \bar{p} - 2 \cdot \bar{q}, \bar{b} = \bar{p} + 3 \cdot \bar{q}, |\bar{p}| = \frac{1}{2}, |\bar{q}| = 2, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{2}.$$

$$5. \bar{a} = \{3, 1, -1\}; \bar{b} = \{1, 0, -1\}; \bar{c} = \{8, 3, -2\}.$$

$$6. A_1(-1, 2, -3); A_2(4, -1, 0); A_3(2, 1, -2); A_4(3, 4, 5).$$

Вариант №19.

$$1. \bar{x} = \{-9, -8, -3\}; \bar{p} = \{1, 4, 1\}; \bar{q} = \{-3, 2, 0\}; \bar{r} = \{1, -1, 2\}.$$

$$2. \bar{a} = \{3, -1, 6\}; \bar{b} = \{5, 7, 10\}; \bar{c}_1 = 4 \cdot \bar{a} - 2 \cdot \bar{b}; \bar{c}_2 = -2 \cdot \bar{a} + \bar{b}.$$

$$3. A(-4, 3, 0); B(0, 1, 3); C(-2, 4, -2).$$

$$4. \bar{a} = 6 \cdot \bar{p} - \bar{q}, \bar{b} = \bar{p} + \bar{q}, |\bar{p}| = 3, |\bar{q}| = 4, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{4}.$$

$$5. \bar{a} = \{4, 2, 2\}; \bar{b} = \{-3, -3, -3\}; \bar{c} = \{2, 1, 2\}.$$

$$6. A_1(4, -1, 3); A_2(-2, 1, 0); A_3(0, -5, 1); A_4(3, 2, 0).$$

Вариант №20.

$$1. \bar{x} = \{-5, 9, -13\}; \bar{p} = \{0, 1, -2\}; \bar{q} = \{3, -1, 1\}; \bar{r} = \{4, 1, 0\}.$$

$$2. \bar{a} = \{1, -2, 4\}; \bar{b} = \{7, 3, 5\}; \bar{c}_1 = 6 \cdot \bar{a} - 3 \cdot \bar{b}; \bar{c}_2 = -2 \cdot \bar{a} + \bar{b}.$$

$$3. A(1, -1, 0); B(-2, -1, 4); C(8, -1, -1).$$

$$4. \bar{a} = 10 \cdot \bar{p} + \bar{q}, \bar{b} = 3 \cdot \bar{p} - 2 \cdot \bar{q}, |\bar{p}| = 4, |\bar{q}| = 1, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{6}.$$

$$5. \bar{a} = \{4, 1, 2\}; \bar{b} = \{9, 2, 5\}; \bar{c} = \{1, 1, -1\}.$$

$$6. A_1(1, -1, 1); A_2(-2, 0, 3); A_3(2, 1, -1); A_4(2, -2, -4).$$

Вариант №21.

1. $\bar{x} = \{-15, 5, 6\}$; $\bar{p} = \{0, 5, 1\}$; $\bar{q} = \{3, 2, -1\}$; $\bar{r} = \{-1, 1, 0\}$.
2. $\bar{a} = \{3, 7, 0\}$; $\bar{b} = \{4, 6, -1\}$; $\bar{c}_1 = 3 \cdot \bar{a} + 2 \cdot \bar{b}$; $\bar{c}_2 = 5 \cdot \bar{a} - 7 \cdot \bar{b}$.
3. $A(7, 0, 2)$; $B(7, 1, 3)$; $C(8, -1, 2)$.
4. $\bar{a} = 6 \cdot \bar{p} - \bar{q}$, $\bar{b} = \bar{p} + 2 \cdot \bar{q}$, $|\bar{p}| = 8$, $|\bar{q}| = \frac{1}{2}$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{3}$.
5. $\bar{a} = \{5, 3, 4\}$; $\bar{b} = \{4, 3, 3\}$; $\bar{c} = \{9, 5, 8\}$.
6. $A_1(1, 2, 0)$; $A_2(-2, 0, 3)$; $A_3(2, 1, -1)$; $A_4(2, -2, -4)$.

Вариант №22.

1. $\bar{x} = \{8, 9, 4\}$; $\bar{p} = \{1, 0, 1\}$; $\bar{q} = \{0, -2, 1\}$; $\bar{r} = \{1, 3, 0\}$.
2. $\bar{a} = \{-2, -1, 4\}$; $\bar{b} = \{3, -7, -6\}$; $\bar{c}_1 = 2 \cdot \bar{a} - 3 \cdot \bar{b}$; $\bar{c}_2 = 3 \cdot \bar{a} - 2 \cdot \bar{b}$.
3. $A(2, 3, 2)$; $B(-1, -3, -1)$; $C(-3, -7, -3)$.
4. $\bar{a} = 3 \cdot \bar{p} + 4 \cdot \bar{q}$, $\bar{b} = -\bar{p} + \bar{q}$, $|\bar{p}| = 2,5$; $|\bar{q}| = 2$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{2}$.
5. $\bar{a} = \{3, 4, 2\}$; $\bar{b} = \{1, 1, 0\}$; $\bar{c} = \{8, 11, 6\}$.
6. $A_1(1, 0, 2)$; $A_2(1, 2, -1)$; $A_3(2, -2, 1)$; $A_4(2, 1, 0)$.

Вариант №23.

1. $\bar{x} = \{23, -14, -30\}$; $\bar{p} = \{2, 1, 0\}$; $\bar{q} = \{1, -1, 0\}$; $\bar{r} = \{-3, 2, 5\}$.
2. $\bar{a} = \{5, -1, -2\}$; $\bar{b} = \{6, 0, 7\}$; $\bar{c}_1 = 3 \cdot \bar{a} - 2 \cdot \bar{b}$; $\bar{c}_2 = -6 \cdot \bar{a} + 4 \cdot \bar{b}$.
3. $A(2, 2, 7)$; $B(0, 0, 6)$; $C(-2, 5, 7)$.
4. $\bar{a} = 7 \cdot \bar{p} + \bar{q}$, $\bar{b} = \bar{p} - 3 \cdot \bar{q}$, $|\bar{p}| = 3$, $|\bar{q}| = 1$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{3\pi}{4}$.
5. $\bar{a} = \{4, -1, -6\}$; $\bar{b} = \{1, -3, -7\}$; $\bar{c} = \{2, -1, -4\}$.
6. $A_1(1, 2, -3)$; $A_2(1, 0, 1)$; $A_3(-2, -1, 0)$; $A_4(0, -5, -4)$.

Вариант №24.

1. $\bar{x} = \{3, 1, 3\}$; $\bar{p} = \{2, 1, 0\}$; $\bar{q} = \{1, 0, 1\}$; $\bar{r} = \{4, 2, 1\}$.
2. $\bar{a} = \{-9, 5, 3\}$; $\bar{b} = \{7, 1, -2\}$; $\bar{c}_1 = 2 \cdot \bar{a} - \bar{b}$; $\bar{c}_2 = 3 \cdot \bar{a} + 5 \cdot \bar{b}$.
3. $A(-1, 2, -3)$; $B(0, 1, -2)$; $C(-3, 4, -5)$.

$$4. \bar{a} = \bar{p} + 3 \cdot \bar{q}, \bar{b} = 3 \cdot \bar{p} - \bar{q}, |\bar{p}| = 3, |\bar{q}| = 5, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{2\pi}{3}.$$

$$5. \bar{a} = \{3, 1, 0\}; \bar{b} = \{-5, -4, -5\}; \bar{c} = \{4, 2, 4\}.$$

$$6. A_1(3, 10, -1); A_2(-2, 3, -5); A_3(-6, 0, -3); A_4(1, -1, 2).$$

Вариант №25.

$$1. \bar{x} = \{-1, 7, 0\}; \bar{p} = \{0, 3, 1\}; \bar{q} = \{1, -1, 2\}; \bar{r} = \{2, -1, 0\}.$$

$$2. \bar{a} = \{4, 2, 9\}; \bar{b} = \{0, -1, 3\}; \bar{c}_1 = -3 \cdot \bar{a} + 4 \cdot \bar{b}; \bar{c}_2 = 4 \cdot \bar{a} - 3 \cdot \bar{b}.$$

$$3. A(0, 3, -6); B(9, 3, 6); C(12, 3, 3).$$

$$4. \bar{a} = 2 \cdot \bar{p} + \bar{q}, \bar{b} = \bar{p} - 3 \cdot \bar{q}, |\bar{p}| = 7, |\bar{q}| = 2, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{4}.$$

$$5. \bar{a} = \{3, 1, 0\}; \bar{b} = \{-5, -4, -5\}; \bar{c} = \{4, 2, 4\}.$$

$$6. A_1(-1, 2, 4); A_2(-1, -2, -4); A_3(3, 0, -1); A_4(7, -3, 1).$$

Вариант №26.

$$1. \bar{x} = \{11, -1, 4\}; \bar{p} = \{1, -1, 2\}; \bar{q} = \{3, 2, 0\}; \bar{r} = \{-1, 1, 1\}.$$

$$2. \bar{a} = \{2, -1, 6\}; \bar{b} = \{-1, 3, 8\}; \bar{c}_1 = 5 \cdot \bar{a} - 2 \cdot \bar{b}; \bar{c}_2 = 2 \cdot \bar{a} - 5 \cdot \bar{b}.$$

$$3. A(3, 3, -1); B(5, 1, -2); C(4, 1, -3).$$

$$4. \bar{a} = 5 \cdot \bar{p} - \bar{q}, \bar{b} = \bar{p} + \bar{q}, |\bar{p}| = 5, |\bar{q}| = 3, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{5 \cdot \pi}{6}.$$

$$5. \bar{a} = \{1, -1, 4\}; \bar{b} = \{1, 0, 3\}; \bar{c} = \{1, -3, 8\}.$$

$$6. A_1(0, -3, 1); A_2(-4, 1, 2); A_3(2, -1, 5); A_4(3, 1, -4).$$

Вариант №27.

$$1. \bar{x} = \{-13, 2, 18\}; \bar{p} = \{1, 1, 4\}; \bar{q} = \{-3, 0, 2\}; \bar{r} = \{1, 2, -1\}.$$

$$2. \bar{a} = \{5, 0, 8\}; \bar{b} = \{-3, 1, 7\}; \bar{c}_1 = 3 \cdot \bar{a} - 4 \cdot \bar{b}; \bar{c}_2 = -9 \cdot \bar{a} + 12 \cdot \bar{b}.$$

$$3. A(-2, 1, 1); B(2, 3, -2); C(0, 0, 3).$$

$$4. \bar{a} = 3 \cdot \bar{p} - 4 \cdot \bar{q}, \bar{b} = \bar{p} - 3 \cdot \bar{q}, |\bar{p}| = 2, |\bar{q}| = 3, \left(\widehat{\bar{p}\bar{q}} \right) = \frac{\pi}{4}.$$

$$5. \bar{a} = \{6, 3, 4\}; \bar{b} = \{-1, -2, -1\}; \bar{c} = \{2, 1, 2\}.$$

$$6. A_1(1, 3, 0); A_2(4, -1, 2); A_3(3, 0, 1); A_4(-4, 3, 5).$$

Вариант №28.

1. $\bar{x} = \{0, -8, 9\}$; $\bar{p} = \{0, -2, 1\}$; $\bar{q} = \{3, 1, -1\}$; $\bar{r} = \{4, 0, 1\}$.
2. $\bar{a} = \{-1, 3, 4\}$; $\bar{b} = \{2, -1, 0\}$; $\bar{c}_1 = 6 \cdot \bar{a} - 2 \cdot \bar{b}$; $\bar{c}_2 = -3 \cdot \bar{a} + \bar{b}$.
3. $A(1, 4, -1)$; $B(-2, 4, -5)$; $C(8, 4, 0)$.
4. $\bar{a} = 6 \cdot \bar{p} - \bar{q}$, $\bar{b} = \bar{p} + 5 \cdot \bar{q}$, $|\bar{p}| = \frac{1}{2}$, $|\bar{q}| = 4$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{5\pi}{6}$.
5. $\bar{a} = \{4, 1, 1\}$; $\bar{b} = \{-9, -4, -9\}$; $\bar{c} = \{6, 2, 6\}$.
6. $A_1(-2, -1, -1)$; $A_2(0, 3, 2)$; $A_3(3, 1, -4)$; $A_4(-4, 7, 3)$.

Вариант №29.

1. $\bar{x} = \{8, -7, -13\}$; $\bar{p} = \{0, 1, 5\}$; $\bar{q} = \{3, -1, 2\}$; $\bar{r} = \{-1, 0, 1\}$.
2. $\bar{a} = \{4, 2, -7\}$; $\bar{b} = \{5, 0, -3\}$; $\bar{c}_1 = \bar{a} - 3 \cdot \bar{b}$; $\bar{c}_2 = -2 \cdot \bar{a} + 6 \cdot \bar{b}$.
3. $A(0, 1, 0)$; $B(0, 2, 1)$; $C(1, 2, 0)$.
4. $\bar{a} = 2 \cdot \bar{p} + 3 \cdot \bar{q}$, $\bar{b} = \bar{p} - 2 \cdot \bar{q}$, $|\bar{p}| = 2$, $|\bar{q}| = 1$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{3}$.
5. $\bar{a} = \{-3, 3, 3\}$; $\bar{b} = \{-4, 7, 6\}$; $\bar{c} = \{3, 0, -1\}$.
6. $A_1(-3, -5, 6)$; $A_2(2, 1, -4)$; $A_3(0, -3, -1)$; $A_4(-5, 2, -8)$.

Вариант №30.

1. $\bar{x} = \{2, 7, 5\}$; $\bar{p} = \{1, 0, 1\}$; $\bar{q} = \{1, -2, 0\}$; $\bar{r} = \{0, 3, 1\}$.
2. $\bar{a} = \{2, 0, -5\}$; $\bar{b} = \{1, -3, 4\}$; $\bar{c}_1 = 2 \cdot \bar{a} - 5 \cdot \bar{b}$; $\bar{c}_2 = 5 \cdot \bar{a} - 2 \cdot \bar{b}$.
3. $A(-4, 0, 4)$; $B(-1, 6, 7)$; $C(1, 10, 9)$.
4. $\bar{a} = 2 \cdot \bar{p} - 3 \cdot \bar{q}$, $\bar{b} = 5 \cdot \bar{p} + \bar{q}$, $|\bar{p}| = 2$, $|\bar{q}| = 3$, $\left(\widehat{\bar{p}\bar{q}}\right) = \frac{\pi}{2}$.
5. $\bar{a} = \{-7, 10, -5\}$; $\bar{b} = \{0, -2, -1\}$; $\bar{c} = \{-2, 4, -1\}$.
6. $A_1(2, -4, -3)$; $A_2(5, -6, 0)$; $A_3(-1, 3, -3)$; $A_4(-10, -8, 7)$.