

1. $\vec{AB} = (1, 2, 3)$, $A(1, 1, 1)$, $B(1, 1, 1)$, $C(1, 1, 1)$, $D(1, 1, 1)$
2. $l: y = \sqrt{3}x + 1$
 A $\frac{1}{3}$ B $\frac{1}{6}$ C $\frac{2}{3}$ D $\frac{5}{6}$
3. $C: \frac{x^2}{4} + y^2 = 1$
 A $y = \frac{1}{4}x$ B $y = \frac{1}{2}x$ C $y = 2x$ D $y = 4x$
4. $x, y \in \mathbf{R}$, $\vec{a} = (x, 2, 1)$, $\vec{b} = (2, 4, 4)$, $\vec{a} \perp \vec{b}$, $\vec{a} \cdot (\vec{a} - \vec{b})$
 A 3 B 4 C 6 D 9
- 5.

- 13cm 9.5cm 0.683 3.2cm
- 0.6 8cm
- A 9cm B 10cm C 11cm D 12cm



6. $l: C: x^2 + y^2 - 2x - 4y - 20 = 0$
 A $3x + 4y - 2 = 0$ B $x - 2 - 4x - 3y + 2 = 0$
 C $3x + 4y - 2 = 0$ D $3x + 4y - 14 = 0$

7. $\triangle ABC$, $AB = AC = \sqrt{2}BC$, M on AC , N on CM , $AN \perp CN$, $\frac{BM}{CM}$
 A $\frac{1}{4}$ B $\frac{1}{3}$ C $\frac{\sqrt{2}}{4}$ D $\frac{\sqrt{2}}{3}$

8. O origin, $l_1: (m-1)x + 2m(y-1) - 2 = 0$, P on l_1 , $l_2: 3x + 4y - 12 = 0$
 A $[1, 3]$ B $[1, 5]$ C $[2, 4]$ D $[2, 6]$

- 4 5 20 .
- 5 0 3 .
9. l_1 , $l_2: y = x + 1$
 A $l_1 \parallel l_2$ B $l_1 \perp l_2$ C $l_1 \perp l_2$ D $l_1 \parallel l_2$

10. $ABC \ A_1B_1C_1 \ AB_1 \cap A_1B=O \ P \ CA_1 \ 2CP \ PA_1$

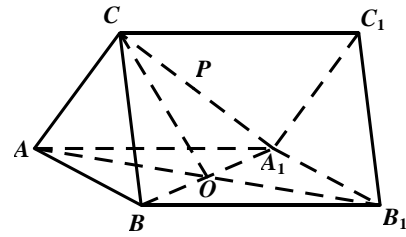
$\vec{CA} \ \vec{a}, \vec{CB} \ \vec{b} \ \vec{CC_1} \ \vec{c},$

A $\vec{CP} = \frac{1}{3}(\vec{a} + \vec{c})$

B $\vec{CO} = \frac{1}{2}(\vec{a} + \vec{b} + \vec{c})$

C $OP \parallel C_1A_1B_1$

D $Q \ C_1AB \ x, y \in \mathbf{R} \ \vec{CQ} = x\vec{a} + y\vec{b} + (1-x-y)\vec{c}$



11. $ABCD \ A_1B_1C_1D_1 \ 2 \ E \ F \ CC_1 \ B_1C_1$

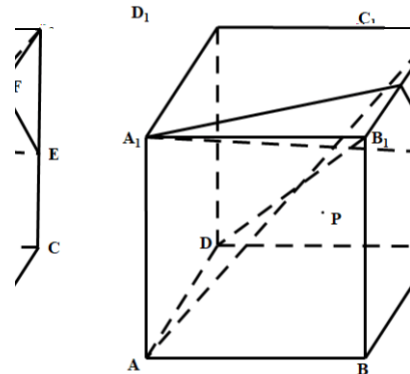
P ABB_1A_1

A $A_1F \ BC \ \frac{1}{4}$

B $A_1EF \ \frac{9}{2}$

C $PF \ B_1D \ P \ \sqrt{2}$

D $DP \ AC_1 \ P \ A_1B$



12. $C: |\frac{x}{4}|^n + |y|^n = 1 (n \in \mathbf{N}^*)$

A $n \in \mathbf{N} \ C \ (1,0), (0, 4) \ B \ n=1 \ C \ 8$

C $n \in \mathbf{N} \ C \ 16 \ D \ n \ C$

4 5 20 2 3 .

13. $(2,0), (-2,0) \ A(\sqrt{6},1) \ \underline{\hspace{2cm}}$

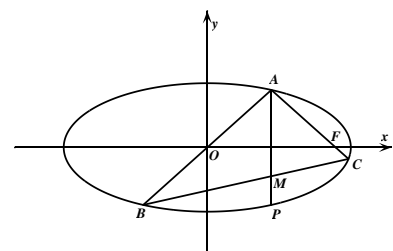
14. $C_1: x^2 + y^2 - 2x - 6y + 15 = 0 \ C_2: x^2 + y^2 - x + 4y - 11 = 0$

$C_1, C_2 \ \underline{\hspace{2cm}}$

15. $\frac{x^2}{5} + y^2 = 1 \ \triangle ABC \ AB \ AC$

F $BAC \ BC \ M \ P \ AP \ x$

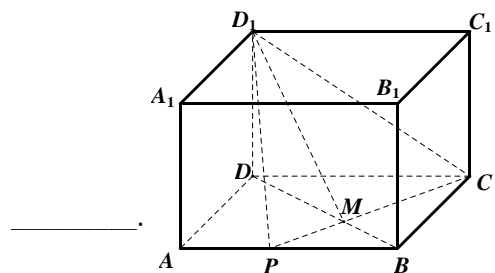
A $x_0 \ \frac{|AM|}{|AP|} \ \underline{\hspace{2cm}}$



16. $ABCD \ A_1B_1C_1D_1 \ AB = 2AD = 6, AA_1 = 4$

P $AB \ CP \ BD \ M$

$CD_1P \ \underline{\hspace{2cm}} \ CD_1M \ \underline{\hspace{2cm}}$



12

17. 10 ABC $A(-1,0), B(2,0), C(0,3)$.

BC

$P(1,3)$ l ABC l .

18. 12 $C: y^2 = 2px (p > 0)$ F x Q $M(m,4)$ C

MQF 4.

C

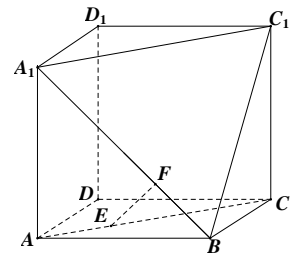
l C C 8 l .

19. 12 $ABCD$ $A_1B_1C_1D_1$ A_1BC_1

E AC $CE = 2AE$ F A_1B $A_1F = 2BF$.

EF BC_1

A_1BC_1 CDD_1C_1 .



20. 12 $l: y = \frac{1}{2}x + 1$ $C: x^2 + y^2 = r^2$ $y = \frac{2}{x}$ P

$|PA| = |PB|$.

P

P C $\cos \angle APB$.

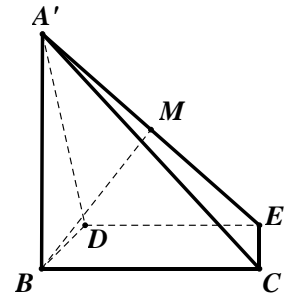
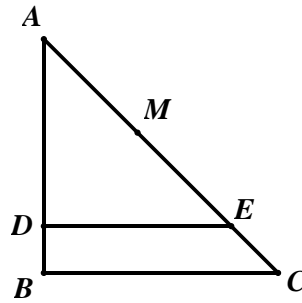
21. $\frac{AD}{AB} = \frac{AE}{AC} = \frac{4}{5}$ M AE

$\triangle ABC$ $\triangle ABC$ 90° , $AB = BC = 5$
 $\triangle ADE$ DE $\triangle ADE$

$\angle ADB = 90^\circ$ $AB = BM$

$\angle ADB = 60^\circ$ $BM = 3$ $AB = \sqrt{15}$

$AB \parallel BC$



22. $C: \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ($a > b > 0$) $\frac{\sqrt{2}}{2} C$

$2\sqrt{2} = 2$.

C

C

AB

8 5 40 .

1-4:BCBD 5-8:BDAC

8. $l_1: m(x-2y-2) = x^2 + 0$ A(2,0)
 l_1 l_1 P OA C(1,0) 1
 C(1,0) $l_2: d = \frac{15}{5} = 3$ P l_2 [d 1, d 1] [2,4]

4 5 20 .

5 0 3 .
 9. BC 10. ABD 11. BCD 12. BC

12. $n \in \mathbb{N}$ $1^n = 1$ C (4,0), (0, 1) A

$n-1$ C



8 B

0 x 1,0 y 4 x_0

n $(\frac{x_0}{4})^n$ 0

$(\frac{x_0}{4})^n y^n = 1$ n $y^n = 1$ y 1.

n C



C D .

4 5 20

2 3 .

13. $\frac{x^2}{3} + y^2 = 1$ 14. $3x - 2y + 4 = 0$ 15. $1 - \frac{3}{4}$ 16. $10 - 2\sqrt{13} - \frac{12\sqrt{377}}{29}$

16. 1 ABC_1D_1 AB ABCD ABC_2D_2

D_1P CP CD_1 $\sqrt{6^2 + 8^2} = 10$

CD_1P CD_1 CD_2 $2\sqrt{13} = 10$

2 DA, DC, DD_1

$D(0,0,0), C(0,6,0), B(3,6,0), D_1(0,0,4)$ $\overline{DB} = (3,6,0), \overline{D_1C} = (0,6,4)$

$\vec{m} = (x,y,z)$ $\overline{DB} \cdot \vec{m} = 0, \overline{D_1C} \cdot \vec{m} = 0$ $3x + 6y = 0$ $6y + 4z = 0$ $\vec{m} = (4,2,3)$

BD D_1C $d = \frac{|\overline{DD_1} \cdot \vec{m}|}{|\vec{m}|} = \frac{12}{\sqrt{29}}$

CD_1M $S = \frac{1}{2} CD_1 d = \frac{1}{2} \cdot 2\sqrt{13} \cdot \frac{12}{\sqrt{29}} = \frac{12\sqrt{377}}{29}$

6 70

17 10

12

17. BC M $(\frac{2}{2}, \frac{0}{2}, \frac{0}{2}) = (1, \frac{3}{2})$ M $(1, \frac{3}{2})$ 1

BC AM $k_{AM} = \frac{3}{4}$ 3

$y = 0$ $\frac{3}{4}[x - 1]$ $y = \frac{3}{4}x - \frac{3}{4}$ $3x - 4y - 3 = 0$ 5

l x 1 P(1,3) ABC 6

18.

$$l, k_{AP} \frac{0}{1} \frac{3}{1} \frac{3}{2} k_{BP} \frac{0}{2} \frac{3}{1} 3 k_{CP} \frac{3}{0} \frac{3}{1} 0 \quad 9$$

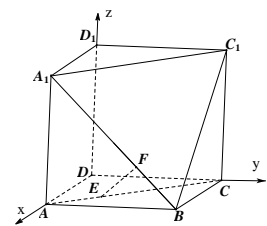
$$l \quad (\quad , 3] \cup [0, \quad) \quad 10$$

$$S_{MQF} \frac{1}{2} |QF| \quad 4 \quad 4 \quad 2$$

$$|QF| \quad p \quad 2p \quad 4 \quad p \quad 2 \quad 3$$

$$C \quad y^2 \quad 4x \quad 4$$

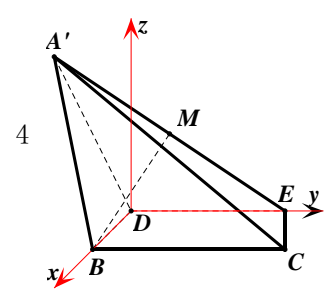
$$C \quad (1,0) \quad l$$



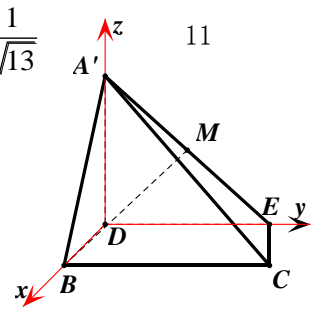
$$\begin{array}{l}
P \quad (1, 2) \quad \cos APB \quad (1,2) \\
\cos APB \quad \frac{2}{5} \quad 11 \quad \cos APB \quad \frac{2}{5} \quad 12 \\
P \quad (1,2) \quad OP \quad AB \quad H \quad APB \quad BOH \quad 6 \\
|OH| \quad \frac{|1|}{\sqrt{1-\frac{1}{4}}} \quad \frac{2}{\sqrt{5}} \quad |OB| \quad |OP| \quad \sqrt{5} \quad 8 \\
\cos BOH \quad \frac{|OH|}{|OB|} \quad \frac{2}{5} \quad 9 \quad \cos APB \quad \cos(\quad) \quad \frac{2}{5} \quad 10 \\
P \quad (1, 2) \quad \cos APB \quad (1,2) \\
\cos APB \quad \frac{2}{5} \quad 11 \quad \cos APB \quad \frac{2}{5} \quad 12
\end{array}$$

21.

$$\begin{array}{l}
DB, DE, DA \quad DB, DE, DA \\
A(0,0,4), B(1,0,0), C(1,5,0), E(0,4,0), M(0,2,2) \quad 1 \\
\overline{AB} \quad (1,0,4), \overline{BM} \quad (1,2,2) \quad 2 \\
\cos \overline{AB}, \overline{MC} \quad \frac{|\overline{AB} \cdot \overline{BM}|}{|\overline{AB}| |\overline{BM}|} \quad \frac{|1 \cdot 0 + 0 \cdot 8|}{\sqrt{17} \cdot 3} \quad \frac{3\sqrt{17}}{17} \\
AB \quad CM \quad \frac{3\sqrt{17}}{17} \quad 5 \\
A \quad BCED \quad DB \\
x \quad y \quad D \quad xyz \\
D(0,0,0), B(1,0,0), C(1,5,0), E(0,4,0) \quad 6 \\
ADB \quad 60 \quad AD \quad 4 \quad A(2,0,2\sqrt{3}), M(1,2,\sqrt{3}) \quad 7 \\
\overline{BA} \quad (1,0,2\sqrt{3}), \overline{BM} \quad (0,2,\sqrt{3}), \overline{BC} \quad (0,5,0) \quad 8 \\
m(x,y,z) \quad MBC \quad \begin{array}{l} m \overline{BC} \quad 0 \quad 5y \quad 0 \\ m \overline{BM} \quad 0 \quad 2y \quad \sqrt{3}z \quad 0 \end{array} \quad 9
\end{array}$$



$$\begin{array}{l}
m(1,0,0) \quad 10 \\
AB \quad MBC \quad \sin \frac{|m \cdot \overline{BA}|}{|m| |\overline{BA}|} \quad \frac{1}{\sqrt{13}} \quad 11 \\
\tan \frac{\sin}{\cos} \quad \frac{\sqrt{3}}{6} \quad 12 \\
DM \quad DM \quad 2\sqrt{2}, BD \quad 1 \quad 6 \\
BM \quad 3 \quad BM^2 \quad DM^2 \quad BD^2 \quad BD \quad DM \\
BD \quad DE, DE \cap DM \quad D \quad BD \quad ADE \quad 7 \\
DB, DE, DA \quad DB, DE, DA \\
A(0,0,4), B(1,0,0), C(1,5,0), E(0,4,0), M(0,2,2) \quad 8 \\
\overline{BA} \quad (1,0,4), \overline{BM} \quad (1,2,2), \overline{BC} \quad (0,5,0) \quad 9 \\
m(x,y,z) \quad MBC \quad \begin{array}{l} m \overline{BC} \quad 0 \quad x \quad 2y \quad 2z \quad 0 \\ m \overline{BM} \quad 0 \quad 5y \quad 0 \end{array} \quad m(2,0,1) \quad 10
\end{array}$$



$$\begin{array}{l}
AB \quad MBC \quad \sin \frac{|m \cdot \overline{BA}|}{|m| |\overline{BA}|} \quad \frac{2}{\sqrt{85}} \quad 11 \\
\tan \frac{\sin}{\cos} \quad \frac{2}{9} \quad 12
\end{array}$$

$$AB = \sqrt{15}, AD = 4, BD = 1, AB \perp BD \quad 6$$

$$AB \perp BCED \quad BC, BD, BA$$

$$A(0,0,\sqrt{15}), B(0,0,0), C(5,0,0), D(0,1,0), E(4,1,0), M(2, \frac{1}{2}, \frac{\sqrt{15}}{2})$$

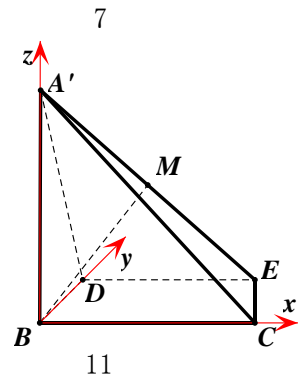
$$\sqrt{\frac{1}{15}} \quad 9$$

$$m(x,y,z) \quad MBC$$

$$\begin{aligned} m \cdot \overrightarrow{BC} &= 0 & 2x - \frac{1}{2}y + \frac{\sqrt{15}}{2}z &= 0 \\ m \cdot \overrightarrow{BM} &= 0 & 5x &= 0 \end{aligned} \quad m(0, \sqrt{15}, 1) \quad 10$$

$$AB \perp MBC \quad \sin \frac{|\overrightarrow{m \cdot BA}|}{|m| \cdot |BA|} = \frac{1}{4}$$

$$\tan \frac{\sin}{\cos} = \frac{\sqrt{15}}{15} \quad 12$$



22.

$$F_1(-c,0), F_2(c,0) \quad \frac{\sqrt{2}}{2} \quad \frac{c}{a} = \frac{\sqrt{2}}{2} \quad 1$$

$$a^2 - c^2 = 2\sqrt{2} \cdot 2 \quad a^2 - 2\sqrt{2}c = 2b^2 - 4 \quad 3$$

$$C \quad \frac{x^2}{8} + \frac{y^2}{4} = 1 \quad 4$$

$$l \quad C \quad A(x_1, y_1) \quad B(x_2, y_2)$$

$$AB \quad l \quad y = kx + m$$

$$\frac{x^2}{8} + \frac{y^2}{4} = 1 \quad (1 - 2k^2)x^2 + 4kmx + 2m^2 - 8 = 0 \quad 5$$

$$16k^2m^2 - 4(1 - 2k^2)(2m^2 - 8) - 8(8k^2 - m^2 - 4) = 0 \quad 8k^2 - m^2 - 4 = 0 \quad 6$$

$$x_1 x_2 = \frac{4km}{1 - 2k^2} \quad x_1 x_2 = \frac{2m^2 - 8}{1 - 2k^2} \quad y_1 y_2 = \frac{m^2 - 8k^2}{1 - 2k^2} \quad 7$$

$$AB \quad \overrightarrow{OA} \cdot \overrightarrow{OB} = 0 \quad x_1 x_2 + y_1 y_2 = 0$$

$$\frac{2m^2 - 8}{1 - 2k^2} + \frac{m^2 - 8k^2}{1 - 2k^2} = 0 \quad k^2 = \frac{3m^2 - 8}{8} \quad 8$$

$$m = \frac{2\sqrt{6}}{3} \quad m = \frac{2\sqrt{6}}{3} \quad 10$$

$$l \quad r = \frac{|m|}{\sqrt{1 + \frac{3m^2}{8}}} = \sqrt{\frac{8}{3}}$$

$$x^2 + y^2 = \frac{8}{3} \quad 11$$

$$l \quad x = \frac{2\sqrt{6}}{3}$$

$$\frac{x^2}{8} + \frac{y^2}{4} = 1 \quad (\frac{2\sqrt{6}}{3}, \frac{2\sqrt{6}}{3}), (\frac{2\sqrt{6}}{3}, -\frac{2\sqrt{6}}{3}) \quad \overrightarrow{OA} \cdot \overrightarrow{OB} = 0 \quad 12$$

$$l \quad C$$

$$AB$$