Topic 1.

Introduction . The purpose of science and duties

Solved from examples samples

Example 1.1. If $A=\{2,4,6,8,10,12\}$ and $B=\{3,6,9,12\}$ collections given if $E=A\cup B$ find the set .

Solution :

$E=A\cup B$ collection A and B of collections union is considered That is , E collection A to B the collection also applies to the collection of the elements consists of will be :

$$E=\{2,3,4,6,8,9,10,12\};$$

Example 1.2. 1 out of 00 people consists of tourists 70 people in the group English language , 45 people French language , 23 people while both he also knows the language . Tourists in the group how many person English French as well doesn't even know the language ?

Solution :

Given in the group English language who knows tourists collection A with , French language who knows tourists collection B with is determined . Even then , it 's English language and French language who knows tourists collection $A\cap B$ collection with is expressed . This two from the language never if not one who knows tourists collection while $A\cup B$ from the collection consists of will be

To the condition of the matter according to $n(A)=70\ n(B)=45\ n(A\cap B)=23$ will be From this the following equality is written :

$$n(A\cup B)=70+45-23=92\,.$$

So 92 people English and French from their languages never when not one knows , 100-92= 8 people while both he doesn't even know the language .

1. Example 3. Given numbers : 17, 274, 607, 718, 5704, 712608. Written of numbers every number 7 in one what means ?

Solution :

Written number 7 in numbers :

17 - unit ,

274 - ten unity ,

607 - unit ,

718 - a hundred unity ,

7504 - thousand unity ,

712608 - hundred a thousand units means

Number Names :

17 – ten n seven ,

274 - two face seventy four ,

607 – six face seven ,

718 – seven face ten eight

7504 – seven a thousand five face four ,

712608 – seven face ten two a thousand six face eight

Example 1.4. Two given a complex number $z = (-1, 2)$ and $w = (3, 2)$. The following calculate :

$$5z - 3w$$

Solution :

$$5z - 3w = 5(-1, 2) - 3(3, 2) = (-5, 10) - (9, 6)$$

$$5z-3w=(-5-9{,}10-6)=(-14,4)$$

1. Example 5. $z^6-28z^3+27=0$ the equation take off

Solution :

Given in Eq $z^3=u$ replacement done , $u^2-28u+27=0$ square to Eq is brought . His the roots are 1 and 27. Now $z^3=1$ and $z^3=27$ equations solves :

$$z_1=1,\ z_{2,3}=\frac{-1\pm\sqrt{3}}{2},\ z_4=3, z_{5,6}=\frac{-3\pm3\sqrt{3i}}{2}$$

Example 1.6. $P(x)=(3x-1)^{99}\cdot(2x-1)^{100}+x^2$ a lot of coefficients the total and free find the term .

Solution :

$P(x)$ a lot of coefficients sum

$$P(1)=(3\cdot1-1)^{99}\cdot(2\cdot1-1)^{100}+1^2=2^{99}+1$$

free Come on while

$$P(0)=(3\cdot0-1)^{99}\cdot(2\cdot0-1)^{100}+0^2=-1$$

will be

Example 1.7. $A=\frac{116^8\cdot87^4}{58^9\cdot174^3}$ the count

Solution :

$$A=\frac{(2\cdot58)^8\cdot87^4}{58^9\cdot(2\cdot87)^3}=\frac{2^8\cdot87}{58\cdot2^3}=\frac{2^5\cdot3\cdot29}{2\cdot29}=48$$

Example 1.8. $\left|\sqrt{x^2-5x}-1\right|=-2$ the equation take off

Solution :

$|f(x)|=a$ in appearance this equation to the solution have not because $a=-2<0$.

1. Example 9. $0,5^{\alpha} > 0,5^{\beta}$ if α Is it big? or β is it

Solution :

$a = 0,5$, that is $0 < a < 1$ that it was for $\beta > \alpha$ will be

Example 10. a $\lg 1000^{67}$) b) $\ln e^{4,8}$ s count

Solution :

a) $\lg 1000^{67} = \lg 10^{3 \cdot 67} = \lg 10^{201} = 201 \cdot \lg 10 = 201 \cdot 1 = 201$

b) $\ln e^{4,8} = 4,8 \ln e = 4,8 \cdot 1 = 4,8$

Issues for independent work

1.1 $M = \{36;29;15;68;27\}$, $P = \{4;15;27;47;36;90\}$, $Q = \{90;4;47\}$ collections given $M \cap P$, $M \cap Q$, $P \cap Q$, $M \cap P \cap Q$ find the

1.2 A of -18 all natural divisors set of , B -24 of all natural divisors collection . $A \cap B$ collection elements show me

1.3 In the words " mathematics " and " grammar ". letters collection make up and this collections find the intersection .

1.4 [1;5] and [3;7] of cross sections find the intersection .

1.5 $A = \{x \mid -5 \le x \le 10\}, B = \{x \mid x \in N, 3 \le x \le 15\}$ let it be $A \setminus B$ and $B \setminus A$ collection find the elements .

1.6 Divide the numbers into prime factors:

10; 100; 1000; 10,000; 100,000; 1 000 000. How to the conclusion to arrive can

1.7 To those who raise the numbers separate :

250; 300; 340; 3,700; 48,950; 4,725,000.

1.8 Find the divisors of the number;

a) 209; b) 143; d) 2 431; e) 2 717.

1.9 Find the common divisors of the numbers:

a) 209 and 143; d) 143 and 2 717;

b) 209 and 2 431; e) 2 431 and 2 717.

1.10 Are the following numbers primes:

a) 15 and 95; d) 143 and 144;

b) 144 and l 69; e) 250 and 131;

1.11 *a, b , c, d* real numbers one at the time to zero equal to that it is not module from the sign using how to write can

1.12 *a, b , c* from the thighs at least two of them mutually equal to that it is not module sign using how to write can

1.13 *a, b , c* s mutually equal to that it is module attended inequality with express

1.14 Solve the equation:

a) $\left\lceil \frac{3x-1}{4} \right\rceil = 5$; d) $[2x+4] = -5$;

b) $\left\lceil \frac{3x}{4} - 1 \right\rceil = 15$; e) $[3x-1] = -4$.

1.15 $n! = 1 \cdot 2 \cdot \ldots \cdot n$ if so , 600! the number how many zero with ends ?

1.16 600! in the spread every which 2, 5, 7 are prime numbers and their to levels of divisors common the number be found

1.17 *a* the *b* to residual be :

a) a =70, b =3;

b) a = 180, b = 9;

c) a =200, b =17;

d) a =76, b =9.

1.18 The total calculate :

a) $\left(\frac{1-\sqrt{2}}{2} + \frac{1-\sqrt{2}}{3}i\right) + \left(\frac{1+\sqrt{2}}{2} + \frac{1-\sqrt{2}}{3}i\right)$

b) $\left(\cos^2\alpha + i\sin^2\alpha\right) + \left(\sin^2\alpha + i\cos^2\alpha\right), (\alpha \in R)$;

c) $\left(0,(3) + i \cdot 1,(5)\right) + \left(0,(6) + i \cdot 1,(55)\right)$

1.19 Calculate the multiplier:

a) $(3+5i)(2+3i)$

b) $(5-3i)(2-5i)$

c) $(4+7i)(2-i)$

d) $(-2+i)(7-3i)$

1.20 Two complex of the thigh division find :

a) $\frac{1+i}{1-i}$

b) $\frac{3-4i}{2+i}$

c) $\frac{2+3i}{2-3i}$

d) $\frac{1+2i}{3-2i}$

1.21 Joint complex of thighs multiple in the form of write $(a,b \in R)$:

a) a^2+4b^2

b) $11a^2+48b^6$

c) $9a^2+25b^2$

d) $8a^2+16b^2$

e) $81a^2+5b^2$

f) $3a^2+45b^4$

1.22 Calculate:

a) $\frac{(2-3i)(3-2i)}{1+i}$

b) $\frac{(3-i)(1+3i)}{2-i}$

c) $\frac{3-4i}{(1+i)(2-i)}$

d) $\frac{2-3i}{(1-i)(3+i)}$

1.23 Do the following:

a) $(3-2i)^2$

b) $(4+3i)^2$

c) $\left(\frac{1-2i}{1+i}\right)^2$

d) $\left(\frac{1+i}{1-i}\right)^2$

1.24 Complex of the plane *z* complex to the thigh suitable coming the point make , in which :

a) $z = 1+2i$

b) $z = -1+2i$

c) $z = -1-2i$

d) $z = 0$

e) $z = 3-2i$

f) $z = -3+2i$

1.25 $z = -3-4i$ the trigonometric in the form write

1.26 $z = 2\cos\frac{7\pi}{4} + 2i\sin\frac{7\pi}{4}$ the trigonometric in the form write

1.27 $z = 2+\sqrt{3}+i$ the trigonometric in the form write

1.28 $z = 1+\cos\varphi + i\sin\varphi\,(-\pi \le \varphi \le \pi)$ the trigonometric in the form write

1.29 Trigonometric in the form given of thighs multiplication find :

a) $z_1 = \frac{\sqrt{2}}{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$ and $z_2 = \cos\frac{\pi}{8} + i\sin\frac{\pi}{8}$

b) $z_1 = \frac{1}{2}\left(\cos\frac{\pi}{15} + i\sin\frac{\pi}{15}\right)$ and $z_2 = 4\left(\cos\frac{\pi}{9} + i\sin\frac{\pi}{9}\right)$

1.30 $\frac{1}{1+z}$ the count , in this $z = \cos\varphi + i\sin\varphi$.

1.31 $(1-\cos\varphi + i\sin\varphi)^{12}$ the count

1.32 Solve quadratic equations :

a) $x^2 + 8ix + 12 = 0$

b) $x^2 + \sqrt{15}ix + 51,5 = 0$

c) $x^2 - 10ix + 24 = 0$

1.33 Solve two-dimensional equations :

a) $27x^3 - 8 = 0$

b) $z^{18} - 1 = 0$

c) $z^5 + 243 = 0$

d) $z^{10} - 59049 = 0$

1.34 If $(5x - 3y) + (x - 2y)i = 6 + (8 - x + y)i$ if x, y real find the numbers .

1.35 Degree basis trigonometric in the form without writing degree calculate :

$(1+i)^{20}$; $(1-i)^{21}$.

1.36 The following *sin* x and *cos* x through express :

a) $\sin 3x$; b $\cos 3x$) d $\sin 4x$) e $\cos 4x$) f $\sin 5x$) d $\cos 5x$) h) $\sin 2x$.

1.37 Expression simplify :

$(a^2 + a + 1)(a^2 - a + 1)(a^4 - a^2 + 1)$

1.38 Euclid algorithm using of polynomials the most big common divisor find :

a) $x^4 + x^3 + 3x^2 - 4x - 1;\ x^3 + x^2 - x - 1;$

b) $x^5 + x^4 - x^3 - 2x - 1;\ 3x^4 + 2x^3 + x^2 + 2x - 2$.

1.39 Find the domain of the expression :

a) $\frac{2x - y}{x(x - y)}$;

b) $\frac{x}{x^2 - y^2}$;

c) $\frac{y}{x - y} - \frac{x}{x + y}$;

d) $\frac{3x + y}{x^3 - y^3} - \frac{y}{3x - 3}$.

1.40 Reduce the fraction :

a) $\frac{21a^3 - 6a^2b}{12ab - 42a^2}$;

b) $\frac{6m^3 - 3mn^2}{2m^3n + mn^2}$.

Answers i

1.4. $[3;5]$

1.5. $A \setminus B = \{x \mid x \in (-5;3) \cup (3;4) \cup (4;5) \cup (5;6) \cup (6;7) \cup (7;8) \cup (8;9) \cup (9;10)\}$

1.6. from 10 starting from , only 10 prime numbers will be , the rest all numbers are not prime numbers .

1.11. $|a| + |b| + |c| + |d| \neq 0$

1.12. $|a-b| + |b-c| + |a-c| \neq 0$

1.14. $a) x \in \left[7 : 8\frac{1}{3}\right); d) x \in \{-4,5;-4)$

1.15. Zeros number 2 and 5 are prime numbers made up couples to the number equal to

1.16. 2 is a prime number 600 for ! will be 594; 7 is a prime number 600 for ! will be 98; 5 is a prime number 600 for ! will be 148.

1.17. $a) 70 = 23 \cdot 3 + 1$; $b) 180 = 20 \cdot 9$; $c) 200 = 11 \cdot 17 + 13$; $d) 76 = 8 \cdot 9 + 4$.

1.18. $a) 1 + \frac{2}{3}i$; $b) 1 + i$; $c) 1 + 3\frac{1}{9}i$.

1.19. $a) -9 + 19i$.

1.20. $b) 2 - 0,6i.$

1.21. $a) a^2 + 4b^2 = (a - 2bi) \times (a + 2bi)$.

1.22. $12,5 - 12,5i.$

1.23. $a) 5 - 12i; b) 7 + 24i$

1.25. $-3 - 4i = 5\left(\cos\left(\pi + arctg\frac{4}{3}\right) + i\sin\left(\pi + arctg\frac{4}{3}\right)\right)$

1.26. $z = 2\left(\cos\frac{7\pi}{4} + i\sin\frac{7\pi}{4}\right)$

1.27. $z = \sqrt{7 + 4\sqrt{3}} \cdot \left(\cos\left(\arctan\left(\frac{1}{2+\sqrt{3}}\right)\right) + i \cdot \sin\left(\arctan\left(\frac{1}{2+\sqrt{3}}\right)\right)\right)$

1.29. $a)\dfrac{\sqrt{2}}{2}\left(\cos\dfrac{3\pi}{8}+i\sin\dfrac{3\pi}{8}\right);\ \ b)3\sqrt{3}\left(\cos\dfrac{\pi}{8}+i\sin\dfrac{\pi}{8}\right).$

1. 32. $a)x_1=0;x_2=-4i;c)x_1=-5i;x_2=-7i$

1.33. $a)x_1=-\dfrac{1}{3}+\dfrac{i\sqrt{3}}{3};\ x_2=-\dfrac{1}{3}-\dfrac{i\sqrt{3}}{3};x_3=\dfrac{2}{3}$

1.34. $x=-\dfrac{2}{3};y=-\dfrac{28}{9}$

1.35. $-2^{10};-2^{10}(1-i)$

1.37. a^8+a^4+1

1.38. $a)x+1;\quad b)x^2+1$

1.39. $a)\left\{(x;y)\mid x\in R,y\in R,x\neq 0,x\neq y\right\}$

1.40. $a)-\dfrac{a}{2}$