

**2017-2018 7<sup>th</sup> Grade First Mid-term Mathematics Test, Yexi Middle School, Yuexi County, Anqing City, Anhui Province**

One, multiple choice questions (8 questions, 3 points per question, full score 24 points)

1. (3 points) During the summer flood season, if the highest water level of a certain river is 2.5 meters higher than the warning line water level, and the lowest water level is 1.5 meters lower than the warning line water level, then the highest water level during this period is \_\_\_\_ higher than the lowest water level (      )

A · 1m      B · 4m      C · - 1m      D · - 4m

2. (3 points) Which of the following calculations is correct? (      )

A ·  $2a+3b=5ab$       B ·  $2a - 3b= - 1$       C ·  $2a^2b - 2ab^2=0$       D ·  $2ab - 2ba=0$

3. (3 points) On the number line, Point A represents - 3. Starting from A, move 4 units along the number line to B, therefore point B represents (      )

A · - 7      B · 1      C · 4      D · - 7 or 1

4. (3 points) What is 8.03 million written in scientific notation? (      )

A ·  $8 \times 10^6$       B ·  $8.03 \times 10^6$       C ·  $8.03 \times 10^7$       D ·  $803 \times 10^4$

5. (3 points) How many whole numbers have an absolute value greater than 2 but less than 5? (      )

A · 0 B · 7 C · 14 D · 28

6. (3 points) If  $3 < a < 4$ , simplify  $|a - 3| + |a - 4| = ( \quad )$

A ·  $2a - 7$  B ·  $2a - 1$  C · 1 D · 7

7. (3 points) Given that the value of algebraic expression  $x + 2y + 1$  is 3, then the value of  $2x + 4y + 1$  is  $( \quad )$

A · 4 B · 5 C · 7 D · It cannot be confirmed

8. (3 points) Observe the following equations:

$$1 \times 2 = \frac{1}{3} (1 \times 2 \times 3 - 0 \times 1 \times 2) \cdot$$

$$2 \times 3 = \frac{1}{3} (2 \times 3 \times 4 - 1 \times 2 \times 3) \cdot$$

$$3 \times 4 = \frac{1}{3} (3 \times 4 \times 5 - 2 \times 3 \times 4) \cdot$$

...

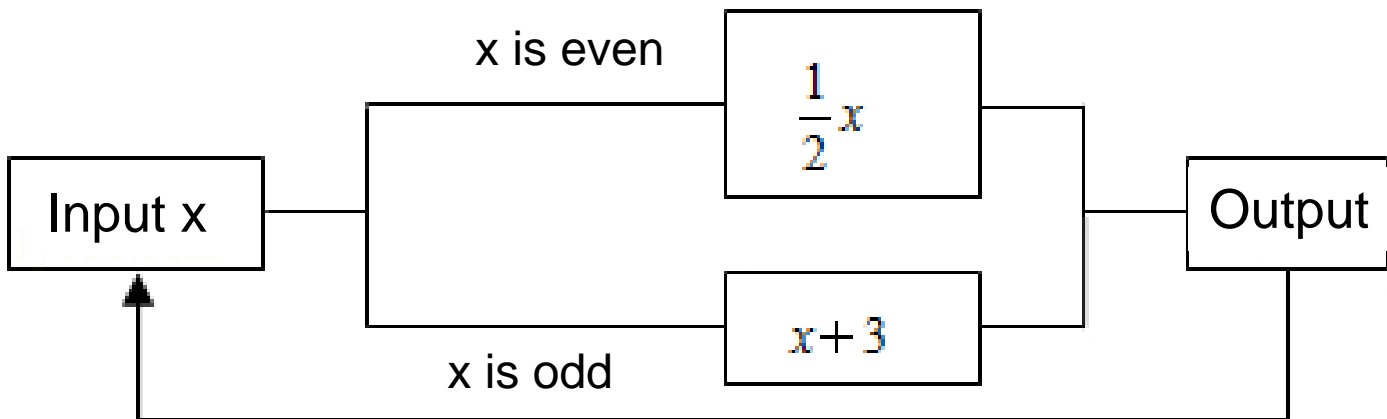
Calculate:  $3 \times (1 \times 2 + 2 \times 3 + 3 \times 4 + \dots + 99 \times 100) = ( \quad )$

A ·  $97 \times 98 \times 99$  B ·  $98 \times 99 \times 100$  C ·  $99 \times 100 \times 101$  D ·  $100 \times 101 \times 102$

Two, fill in the blanks (10 questions, 3 points per question, full score 30 points)

9. (3 points) If - 20% represents decreased 20%, then +6% represents \_\_\_\_.

10. (3 points) The coefficient of monomial  $\frac{xy^2}{5}$  is \_\_\_\_\_ .
11. (3 points) Express "3 times the difference of x and 4" in an algebraic expression \_\_\_\_\_ .
12. (3 points) If  $3a^{m+2}b^4$  and  $-a^5b^{n+1}$  has a sum that is a monomial, then  $m+n=$  \_\_\_\_\_ .
13. (3 points) Polynomial  $3x^m y^2 + (m+2)x^2 y - 1$  is a trinomial with a degree of 4. The value of m is \_\_\_\_\_ .
14. (3 points) Simplify:  $-(5x+3y) + (7y-x) =$  \_\_\_\_\_ .
15. (3 points) Polynomial  $2(a^2 - 2ab - b^2) - (a^2 + mab + 2b^2)$  doesn't include the term ab, then  $m=$  \_\_\_\_\_ .
16. (3 points) Points M and N are two points on the number line. If the length of the line segment MN is 2, and point M represents -1, then point N represents \_\_\_\_\_ .
17. (3 points) In the number sequence  $a_1, a_2, a_3, \dots, a_n$ , starting from the second term, each number is equal to the difference between one and the reciprocal of the previous number. If  $a_1=2$ , then  $a_{2007}$  is \_\_\_\_\_ .
18. (3 points) 如图 In the function shown below, if the initial input value x is 48, our first output is 24, the second output is 12, ... , then the 2010<sup>th</sup> output would be \_\_\_\_\_ .



Three, calculation problems (3 questions, total 40 points, please show your work)

19. (20 points) Calculate

(1)  $(-3) + (-4) - (+11) - (-19)$

(2)  $-2^3 - (1 - 0.5) \times \frac{1}{3} \times [2 - (-3)^2]$

(3)  $-3.5 \div \frac{7}{8} \times (-\frac{8}{7}) \times |-\frac{3}{64}|$

(4)  $(\frac{2}{3} - \frac{1}{12} - \frac{4}{15}) \times (-60)$

20. (12 points) First remove brackets, and then combine like terms

(1)  $(4x^2y - 3xy^2) - (1 + 4x^2y - 3xy^2)$

(2)  $4y^2 - [3y - (3 - 2y) + 2y^2] \cdot$

21. (8 points) First simplify, and then substitute:

$$(2a^2b + 2ab^2) - [2(a^2b - 1) + 3ab^2 + 2] \text{ with } a=2 \text{ and } b=-2$$

#### Four, word problems

22. (10 points) Given that  $(x+3)^2$  and  $|y-2|$  are opposite values, and  $z$  is the rational number with the smallest absolute value, find the value of  $(x+y)^y + xyz$ .

23. (10 points) There are two charging methods for telephone dial-up access in a certain place, and users can choose one of them: (A) Per minute: 0.1 dollars/minute; (B) Monthly subscription: 50 dollars/month (Access is limited to one personal residential phone). In addition, each telephone plan has to charge an additional communication fee of 0.2 dollars per minute.

(1) If a user spends  $x$  hours on the phone in a certain month, please write down the fees that the user should pay under the two charging methods;

(2) If a user spends 20 hours on the phone in a month, which method do you think is more cost-effective and why?

24. (12 points) (1) Example: Algebraic expression  $(a+b)^2$  represents the square root of the sum of  $a$  and  $b$ . Fill in the blanks:

Algebraic expression  $a^2 - b^2$  represents \_\_\_\_\_.

Algebraic expression  $(a+b)(a-b)$  represents \_\_\_\_\_.

( 2 ) Calculate the different values of  $a^2 - b^2$  and  $( a + b ) ( a - b )$  under the different given values of a and b. Fill in the blank below.

Value of a and b	$a = 3, b = 2$	$a = -5, b = 1$	$a = -2, b = -5$
$a^2 - b^2$			
$(a+b)(a-b)$			

( 3 ) Please give a and b any random value and then solve for the corresponding values of  $a^2 - b^2$  and  $( a + b ) ( a - b )$  :

When  $a = \underline{\hspace{2cm}}$ ,  $b = \underline{\hspace{2cm}}$ ,  $a^2 - b^2 = \underline{\hspace{2cm}}$  .  $( a + b ) ( a - b ) = \underline{\hspace{2cm}}$  .

( 4 ) My observations:  $\underline{\hspace{2cm}}$  .

( 5 ) Use your observations to solve for  $78.35^2 - 21.65^2$ .

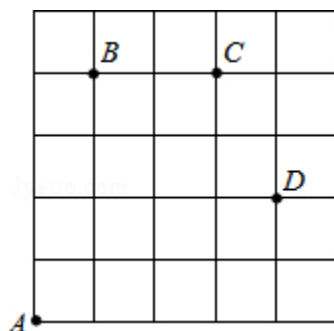
25. (12 points) As shown in the figure, a beetle moves along the grid lines on a  $5 \times 5$  grid (each grid has a side length of 1). It starts from A to visit other beetles at B, C, and D, while moving along the following guidelines: Up and to the right is recorded as positive, down and to the left is recorded as negative. If the beetle traveling from point A to B is recorded as:  $A \rightarrow B ( +1 \cdot +4 )$  , and the beetle traveling from point B to A is recorded as:  $B \rightarrow A ( -1 \cdot -4 )$  . Among them, the

first number indicates the horizontal direction, and the second number indicates the vertical direction. Fill in the blanks:

( 1 )  $A \rightarrow C$  ( \_\_\_\_\_ , \_\_\_\_\_ ) ,  $B \rightarrow C$  ( \_\_\_\_\_ , \_\_\_\_\_ ) ,  
 $C \rightarrow D$  ( \_\_\_\_\_ , \_\_\_\_\_ ) ;

( 2 ) If the beetle's walking route is  $A \rightarrow B \rightarrow C \rightarrow D$ , please calculate the least distance traveled by the beetle;

( 3 ) If the beetle travels from A to beetle P, it follows the route  $( +2 , +2 ) , ( +2 , -1 ) , ( -2 , +3 ) , ( -1 , -2 )$ . Plot the position of beetle P on the grid.



26. (12 points) A bicycle factory plans to produce 1,400 bicycles a week, with an average daily production of 200 bicycles. However, due to various reasons, the actual daily production volume is different from the planned volume. The following table shows the production situation of a certain week (over-production is recorded as positive, and production reduction is recorded as negative):

Day of the week	Mon	Tues	Wed	Thu	Fri	Sat	Sun
Change to planned volume	+5	- 2	- 4	+12	- 10	+16	- 9

- ( 1 ) The factory produced \_\_\_\_\_ bicycles in all on Saturday;
- ( 2 ) This entire week, the factory produced a total of \_\_\_\_\_ bicycles;
- ( 3 ) The most productive day produces \_\_\_\_\_ more bikes than the least productive day;
- ( 4 ) The factory implements a weekly piecework wage system. Every time a car is produced, a worker is paid 50 dollars. If a worker produces more than the required amount of bicycles per day, an additional 15 dollars will be awarded for each exceeding bike. How much money did the worker get paid this entire week?



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Answers and Solutions

One, multiple choice questions (8 questions, 3 points per question, full score 24 points)

1. (3 points) During the summer flood season, if the highest water level of a certain river is 2.5 meters higher than the warning line water level, and the lowest water level is 1.5 meters lower than the warning line water level, then the highest water level during this period is \_\_\_\_ higher than the lowest water level (      )

A · 1m      B · 4m      C · - 1m      D · - 4m

【Analyze】 Subtraction of rational numbers

【Solution】 S: From the problem, we obtain:  $2.5 - (-1.5) = 2.5 + 1.5 = 4$  ·

Correct answer: B

2. (3 points) Which of the following calculations is correct? (      )

A ·  $2a + 3b = 5ab$       B ·  $2a - 3b = -1$       C ·  $2a^2b - 2ab^2 = 0$       D ·  $2ab - 2ba = 0$

【Analyze】 Combine like terms

【Solution】S: A ∵ they are not like terms and therefore cannot be combined, A is incorrect;

B ∵ they are not like terms and therefore cannot be combined, B is incorrect;

C ∵ the exponents of each of the terms cannot be added when combined, C is incorrect;

D ∵ the coefficients are added, and the variables and exponents are not changed, D is correct;

Correct answer: D

3. (3 points) On the number line, Point A represents  $-3$ . Starting from A, move 4 units along the number line to B, therefore point B represents (      )

A ∵  $-7$       B ∵  $1$     C ∵  $4$     D ∵  $-7$  or  $1$

【Analyze】According to the number represented by point A, we can analyze in two separate cases. We can list separate equations for when point A moves to the right along the number axis and when point A moves to the left along the number axis.

【Solution】S: ∵ Point A represents  $-3$ ,

∴ Starting from point A, if the beetle moves 4 units to the right to point B, then B would represent  $-3+4=1$  ;

∴ Starting from point A, if the beetle moves 4 units to the left to point B, then B would represent  $-3-4=-7$  ;

∴ Point B represents either 1 or - 7.

Correct answer: D

4. (3 points) What is 8.03 million written in scientific notation? ( )

A ·  $8 \times 10^6$  B ·  $8.03 \times 10^6$  C ·  $8.03 \times 10^7$  D ·  $803 \times 10^4$

**【Analyze】** Introduction to the scientific notation

**【Solution】** S: 8.03 million = 8 030 000 =  $8.03 \times 10^6$  .

Correct answer: B

5. (3 points) How many whole numbers have an absolute value greater than 2 but less than 5?

( )

A · 0 B · 7 C · 14 D · 28

**【Analyze】** All integers whose absolute value is greater than 2 and less than 5 are all integers between -5 and -2 and between 2 and 5 on the number axis

**【Solution】** S: All of the integers whose absolute value is greater than 2 and less than 5 would be - 4 · - 3 · 3 · 4 ·

Therefore - 4 + ( - 3 ) + 3 + 4 = 0

Correct answer: A

6. (3 points) If  $3 < a < 4$ , simplify  $|a - 3| + |a - 4| = ( \quad )$

A ·  $2a - 7$     B ·  $2a - 1$     C ·  $1$     D ·  $7$

**【Analyze】** Because  $3 < a < 4$ , then  $|a - 3| = a - 3$  ·  $|a - 4| = 4 - a$ , and then simplify.

**【Solution】** S: ∵  $3 < a < 4$  ·

$$\therefore |a - 3| = a - 3 \cdot |a - 4| = 4 - a \cdot$$

$$\therefore |a - 3| + |a - 4| = a - 3 + 4 - a = 1 \cdot$$

Correct answer: C

7. (3 points) Given that the value of algebraic expression  $x + 2y + 1$  is 3, then the value of  $2x + 4y + 1$  is (      )

A ·  $4$     B ·  $5$     C ·  $7$     D · It cannot be confirmed

**【Analyze】** Apply the distributive property to  $2x + 4y + 1$  and then substitute the value of  $x + 2y + 1$  into the converted expression.

**【Solution】** S: Obtained from the problem:

$$x+2y+1=3 \cdot$$

$$\therefore x+2y=2 \cdot$$

$$\text{Then } 2x+4y+1=2 ( x+2y ) +1=2 \times 2+1=5 \cdot$$

Correct answer: B

8. (3 points) Observe the following equations:

$$1 \times 2 = \frac{1}{3} (1 \times 2 \times 3 - 0 \times 1 \times 2) \cdot$$

$$2 \times 3 = \frac{1}{3} (2 \times 3 \times 4 - 1 \times 2 \times 3) \cdot$$

$$3 \times 4 = \frac{1}{3} (3 \times 4 \times 5 - 2 \times 3 \times 4) \cdot$$

...

Calculate:  $3 \times ( 1 \times 2 + 2 \times 3 + 3 \times 4 + \dots + 99 \times 100 ) = ( \quad )$

A ·  $97 \times 98 \times 99$       B ·  $98 \times 99 \times 100$       C ·  $99 \times 100 \times 101$       D ·  $100 \times 101 \times 102$

**【Analyze】** After finding the pattern in  $1 \times 2 \cdot 2 \times 3 \cdot \dots 99 \times 100$ , rewrite the pattern into an equation  $1 \times 2 = \frac{1}{3} \times ( 1 \times 2 \times 3 ) \cdot$

**【Solution】** S: Obtained from the problem:

$$3 \times ( 1 \times 2 + 2 \times 3 + 3 \times 4 + \dots + 99 \times 100 )$$

$$= 3 \times \left[ \frac{1}{3} \times (1 \times 2 \times 3 - 0 \times 1 \times 2) + \frac{1}{3} (2 \times 3 \times 4 - 1 \times 2 \times 3) + \frac{1}{3} (3 \times 4 \times 5 - 2 \times 3 \times 4) + \dots + \frac{1}{3} (99 \times 100 \times 101 - 98 \times 99 \times 100) \right]$$

$$= 1 \times 2 \times 3 - 0 \times 1 \times 2 + 2 \times 3 \times 4 - 1 \times 2 \times 3 + 3 \times 4 \times 5 - 2 \times 3 \times 4 + \dots + 99 \times 100 \times 101 - 98 \times 99 \times 100$$

$$= 99 \times 100 \times 101$$

Correct answer: C

Two, fill in the blanks (10 questions, 3 points per question, full score 30 points)

9. (3 points) If - 20% represents decreased 20%, then +6% represents increased .

**【Analyze】** In a pair of quantities with opposite values, if one of them is defined as positive, the other is expressed as negative.

**【Solution】** S: Since "+" and "-" are opposite,

If - 20% represents decreased 20%, then +6% represents increased 6%.

10. (3 points) The coefficient of monomial  $-\frac{xy^2}{5}$  is -1/5 .

**【Analyze】** Use the definition of monomial coefficient to solve. The numerical factors in a monomial are called the coefficients of the monomial.

【Solution】S: Monomial  $-\frac{xy^2}{5}$  has a coefficient of  $-\frac{1}{5}$ .

Correct answer:  $-\frac{1}{5}$

11. (3 points) Express "3 times the difference of x and 4" in an algebraic expression  $3(x-4)$  .

【Analyze】First find the difference and then the product

【Solution】S: 3 times the difference of x and 4 can be expressed as  $3(x - 4)$  .

Correct answer:  $3(x - 4)$

12. (3 points) If  $3a^{m+2}b^4$  and  $-a^5b^{n-1}$  has a sum that is a monomial, then  $m+n=$  8 .

【Analyze】The two can be combined to show that they are like terms, and the values of m and n can be obtained according to the same variables of like terms and the same exponents of the same variables.

【Solution】S: From the problem, the two can be combined to show that the two monomials are like terms.

We get  $m+2=5$ ,  $n-1=4$ ,

Solved:  $m=3$  ·  $n=5$  ·  $m+n=8$  .

Correct answer: 8

13. (3 points) Polynomial  $3x^{|m|}y^2 + (m+2)x^2y - 1$  is a trinomial with a degree of 4. The value of  $m$  is 2.

**【Analyze】** According to the definition of the quartic trinomial, the highest degree of the polynomial is 4 and the number of terms is 3, so the value of  $m$  can be determined.

**【Solution】** S:  $\because$  Polynomial  $x^{|m|}y^2 + (m+2)x^2y - 1$  is a quartic trinomial,

$$\therefore |m| + 2 = 4, m + 2 \neq 0,$$

$$\therefore |m| = 2, \text{ and } m \neq -2,$$

$$\therefore m = 2.$$

Correct answer; 2

14. (3 points) Simplify:  $-(5x+3y) + (7y-x) = \underline{-6x+4y}$ .

**【Analyze】** This question is the addition and subtraction of integers. Remove brackets and then combine like terms.

**【Solution】** S: Original equation =  $-5x - 3y + 7y - x$

$$= -6x + 4y;$$



Correct answer:  $-6x+4y$

15. (3 points) Polynomial  $2(a^2 - 2ab - b^2) - (a^2 + mab + 2b^2)$  doesn't include the term  $ab$ , then  $m = \underline{\quad -4 \quad}$ .

**【Analyze】** First simplify by isolating  $ab$ .

**【Solution】** S:  $2(a^2 - 2ab - b^2) - (a^2 + mab + 2b^2) = a^2 - (4+m)ab - 4b^2$ .

Also  $\because$  It doesn't include the term  $ab$ , then  $4+m=0$ ,  $m = -4$ .

Correct answer:  $-4$

16. (3 points) Points M and N are two points on the number line. If the length of the line segment MN is 2, and point M represents  $-1$ , then point N represents  $\underline{\quad -3, 1 \quad}$ .

**【Analyze】** According to the meaning of the question, creating the graph correctly can be divided into two situations for discussion:

- ( 1 ) N is left of M;
- ( 2 ) N is right of M.

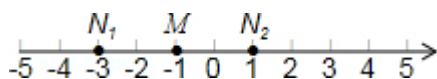
**【Solution】** S: As shown, the position of N cannot be confirmed;

- ( 1 ) N is left of M, point N represents  $-3$  ;

( 2 ) N is right of M, point N represents 1

∴ Point N represents - 3 or 1

Correct answer; - 3, 1



17. (3 points) In the number sequence  $a_1 \cdot a_2 \cdot a_3 \cdot \dots \cdot a_n$ , starting from the second term, each number is equal to the difference between one and the reciprocal of the previous number. If  $a_1=2$ , then  $a_{2007}$  is -1 .

**【Analyze】** Since the pattern and first term had already been given, find the 2007<sup>th</sup> term according to the pattern.

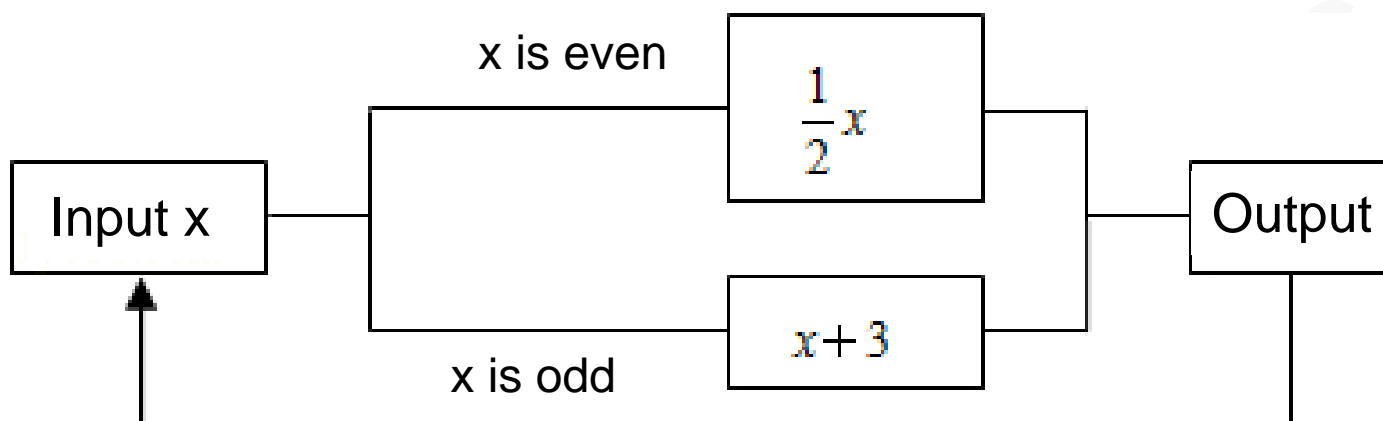
**【Solution】** S: ∵  $a_1=2$

$$\therefore a_2 = 1 - \frac{1}{2} = \frac{1}{2}, a_3 = 1 - \frac{1}{\frac{1}{2}} = 1 - 2 = -1, a_4 = 1 - (-1) = 2, a_5 = 1 - \frac{1}{2} = \frac{1}{2}, a_6 = 1 - 2 = -1, a_7 = 1 - (-1) = 2 \dots$$

∴ Cycle once every three times starting from the second item, and the remainder after dividing  $(2007-1)$  by 3 is 2.

$$\therefore a_{2007} = -1$$

18. (3 points) In the function shown below, if the initial input value  $x$  is 48, our first output is 24, the second output is 12 · ... · then the 2010<sup>th</sup> output would be 3 .



【Analyze】 Record the first few results in a table and then rewrite the pattern as an equation.

【Solution】 S: ∴ The second result is 12,

∴ The third result is 6, the fourth is 3, the fifth is 6, the sixth is 3, ...,

∴ Starting from the third time, the even-numbered output is 3, and the odd-numbered output is 6.

∴ The 2010<sup>th</sup> result would be 3.

Correct answer: 3

Three, calculation problems (3 questions, total 40 points, please show your work)

19. (20 points) Calculate

$$(1) (-3) + (-4) - (+11) - (-19)$$

$$(2) -2^3 - (1 - 0.5) \times \frac{1}{3} \times [2 - (-3)^2]$$

$$(3) -3.5 \div \frac{7}{8} \times (-\frac{8}{7}) \times |-\frac{3}{64}|$$

$$(4) (\frac{2}{3} - \frac{1}{12} - \frac{4}{15}) \times (-60)$$

**【Analyze】** (1) Remove brackets by subtracting the absolute values of the negative numbers

(2) Follow the order of operations

(3) Simplify when multiplying and dividing fractions

(4) Apply the distributive property of multiplication

**【Solution】** S: (1) Original equation =  $-3 - 4 - 11 + 19 = -18 + 19 = 1$  ;

$$(2) \text{ Original equation} = -8 + \frac{7}{6} = -\frac{41}{6} ;$$

$$(3) \text{ Original equation} = \frac{7}{2} \times \frac{8}{7} \times \frac{8}{7} \times \frac{3}{64} = \frac{3}{14} ;$$

$$(4) \text{ Original equation} = -40 + 5 + 16 = -19 .$$

20. (12 points) First remove brackets, and then combine like terms

$$(1) (4x^2y - 3xy^2) - (1 + 4x^2y - 3xy^2)$$

$$(2) 4y^2 - [3y - (3 - 2y) + 2y^2]$$

**【Analyze】** (1) First remove brackets, and then combine like terms;

(2) First remove brackets and then combine like terms;

**【Solution】** S: (1)  $(4x^2y - 3xy^2) - (1 + 4x^2y - 3xy^2)$

$$= 4x^2y - 3xy^2 - 1 - 4x^2y + 3xy^2$$

$$= -1;$$

$$(2) 4y^2 - [3y - (3 - 2y) + 2y^2]$$

$$= 4y^2 - (3y - 3 + 2y + 2y^2)$$

$$= 4y^2 - 5y + 3 - 2y^2$$

$$= 2y^2 - 5y + 3$$

21. (8 points) First simplify, and then substitute:

$$(2a^2b + 2ab^2) - [2(a^2b - 1) + 3ab^2 + 2] \text{ with } a=2, b=-2$$

**【Analyze】** Always simplify and then substitute

**【Solution】** S:  $(2a^2b + 2ab^2) - [2(a^2b - 1) + 3ab^2 + 2]$

$$= 2a^2b + 2ab^2 - (2a^2b - 2 + 3ab^2 + 2)$$

$$= 2a^2b + 2ab^2 - 2a^2b - 3ab^2$$

$$= -ab^2$$

When  $a=2$ , and  $b=-2$ ,

$$\text{Original equation} = -2 \times (-2)^2 = -8$$

#### Four, word problems

22. (10 points) Given that  $(x+3)^2$  and  $|y-2|$  are opposite values, and  $z$  is the rational number with the smallest absolute value, find the value of  $(x+y)^y + xyz$ .

**【Analyze】** The main idea is to determine the values of  $x$ ,  $y$ , and  $z$ , and then substitute them into the calculation.

**【Solution】** S:  $\because (x+3)^2$  and  $|y-2|$  are opposite numbers,

$$\therefore (x+3)^2 + |y-2| = 0$$

$$\text{And } \because (x+3)^2 \geq 0, |y-2| \geq 0$$

$$\therefore x = -3, y = 2$$

$\because z$  is the rational number with the smallest absolute value,

$$\therefore z=0$$

$$\therefore (x+y)^y + xyz = (-3+2)^2 + 0 = 1$$

23. (10 points) There are two charging methods for telephone dial-up access in a certain place, and users can choose one of them: ( A ) Per minute: 0.1 dollars/minute; ( B ) Monthly subscription: 50 dollars/month (Access is limited to one personal residential phone). In addition, each telephone plan has to charge an additional communication fee of 0.2 dollars per minute.

( 1 ) If a user spends  $x$  hours on the phone in a certain month, please write down the fees that the user should pay under the two charging methods;

( 2 ) If a user spends 20 hours on the phone in a month, which method do you think is more cost-effective and why?

**【Analyze】** ( 1 ) Plan (A) = cost per minute  $\times$  time + communication fee, and Plan (B) = monthly fee + communication fee.

( 2 ) Substitute 20 hours as the time into ( 1 ) to calculate the amount each telephone plan costs.

**【Solution】** ( 1 ) Fees payable on an hourly basis are  $(0.1+0.2) \times 60 \times x = 18x$  ( dollars ) .

Fees payable on a monthly basis are  $50 + 0.2 \cdot x \cdot 60 = 50 + 12x$  ( dollars ) ;

( 2 ) if the total amount of time a user spends on the telephone is 20 hours,

According to Plan A it would cost  $18 \times 20 = 360$  ( dollars ) .

According to Plan B it would cost  $50 + 12 \times 20 = 290$  ( dollars ) .

Plan B would be more cost-effective.

24. (12 points) ( 1 ) Example: Algebraic expression  $(a+b)^2$  represents the square root of the sum of a and b. Fill in the blanks:

Algebraic expression  $a^2 - b^2$  represents the difference of the squares of a and b .

Algebraic expression  $(a+b)(a-b)$  represents the product of the sum and difference of a and b .

( 2 ) Calculate the different values of  $a^2 - b^2$  and  $(a+b)(a-b)$  under the different given values of a and b. Fill in the blank below.



Value of a and b	$a = 3, b = 2$	$a = -5, b = 1$	$a = -2, b = -5$
$a^2 - b^2$			
$(a+b)(a-b)$			

( 3 ) Please give a and b any random value and then solve for the corresponding values of  $a^2 - b^2$  and  $( a+b ) ( a - b )$  :

When  $a = \underline{2}$ ,  $b = \underline{1}$ ,  $a^2 - b^2 = \underline{3}$  .  $( a+b ) ( a - b ) = \underline{3}$  .

( 4 ) My observations:  $\underline{a^2 - b^2 = ( a+b ) ( a - b )}$  .

( 5 ) Use your observations to solve for  $78.35^2 - 21.65^2$ .

**【Analyze】** ( 1 ) Fill in according to what each term and operation represents

( 2 ) Substitute each pair of values into the formula

( 3 ) Take a value for a and b arbitrarily, and substitute it into the formula

( 4 ) According to the previous calculations compare the values of  $a^2 - b^2$  and  $( a+b ) ( a - b )$

( 5 ) Use the relationship obtained in ( 4 ) to calculate

**【Solution】** S: ( 1 ) The square difference of a and b; The product of the sum and difference of a and b; ( 2 points )

( 2 ) ( 3 points )

Value of a and b	$a = 3, b = 2$	$a = -5, b = 1$	$a = -2, b = -5$
$a^2 - b^2$			
$(a+b)(a-b)$			

( 3 ) When  $a=2$  and  $b=1$ ,  $a^2 - b^2 = 3 \cdot (a+b)(a-b) = 3$  ;

( 4 )  $a^2 - b^2 = (a+b)(a-b)$  ; ( 2 points )

( 5 )  $78.35^2 - 21.65^2 = (78.35+21.65)(78.35 - 21.65) = 5670$  · ( 3 points )

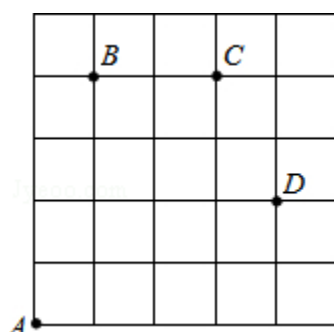
25. (12 points) As shown in the figure, a beetle moves along the grid lines on a  $5 \times 5$  grid (each grid has a side length of 1). It starts from A to visit other beetles at B, C, and D, while moving along the following guidelines: Up and to the right is recorded as positive, down and to the left is recorded as negative. If the beetle traveling from point A to B is recorded as:  $A \rightarrow B (+1 \cdot +4)$  , and the beetle traveling from point B to A is recorded as:  $B \rightarrow A (-1 \cdot -4)$  . Among them, the first number indicates the horizontal direction, and the second number indicates the vertical direction. Fill in the blanks:

( 1 )  $A \rightarrow C$  (   +3   ,   +4   ) ,  $B \rightarrow C$  (   +2   ,   0   ) ,

$C \rightarrow D$  (   +1   ,   -2   ) ;

( 2 ) If the beetle's walking route is  $A \rightarrow B \rightarrow C \rightarrow D$ , please calculate the least distance traveled by the beetle;

( 3 ) If the beetle travels from A to beetle P, it follows the route ( +2 · +2 ) · ( +2 · - 1 ) · ( - 2 · +3 ) · ( - 1 · - 2 ) . Plot the position of beetle P on the grid.



**【Analyze】** ( 1 ) Record the moving beetle with the first number in each coordinate pair as the horizontal movement and the second number in each coordinate pair as the vertical movement.

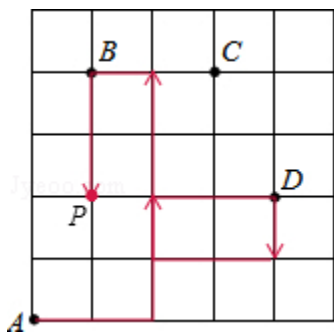
( 2 ) The solution can be obtained by setting the expression according to the walking route;

( 3 ) The solution can be obtained by making a circuit diagram according to the grid and recording method.

**【Solution】** S: ( 1 )  $A \rightarrow C$  ( +3 · +4 ) ·  $B \rightarrow C$  ( +2 · 0 ) ·  $C \rightarrow D$  ( +1 · - 2 ) ;

( 2 )  $1+4+2+1+2=10$  ;

( 3 ) Point P, as shown.



26. (12 points) A bicycle factory plans to produce 1,400 bicycles a week, with an average daily production of 200 bicycles. However, due to various reasons, the actual daily production volume is different from the planned volume. The following table shows the production situation of a certain week (over-production is recorded as positive, and production reduction is recorded as negative):

Day of the week	Mon	Tues	Wed	Thu	Fri	Sat	Sun
Change to planned volume	+5	- 2	- 4	+12	- 10	+16	- 9

- ( 1 ) The factory produced 216 bicycles in all on Saturday;
- ( 2 ) This entire week, the factory produced a total of 1408 bicycles;
- ( 3 ) The most productive day produces 26 more bikes than the least productive day;
- ( 4 ) The factory implements a weekly piecework wage system. Every time a car is produced, a worker is paid 50 dollars. If a worker produces more than the required amount of bicycles per

day, an additional 15 dollars will be awarded for each exceeding bike. How much money did the worker get paid this entire week?

【Analyze】 ( 1 ) Use 200 to add +16;

( 2 ) Assume that 200 bikes were produced each day and then add/subtract the increase/decrease to the actual amount of bikes produced that week.

( 3 ) Subtract the least amount of bikes produced on Friday from the largest amount of bikes produced on Saturday, and calculate it according to the subtraction of rational numbers;

( 4 ) List the expressions according to the instructions given, and then calculate according to the mixed operation method of rational numbers to solve the problem.

【Solution】 S: ( 1 )  $200 + (+16) = 216$  ;

( 2 )  $\therefore (+5) + (-2) + (-4) + (+12) + (-10) + (+16) + (-9)$  .

$= 5 - 2 - 4 + 12 - 10 + 16 - 9$  .

$= 33 - 25$  .

$= 8$  .

$\therefore 1400 + 8 = 1408$  ;

( 3 )  $(+16) - (-10)$  .

$$=16+10 \cdot$$

$$=26 ;$$

$$( 4 ) 50 \times 1408 + 8 \times 15 \cdot$$

$$=70400+120 \cdot$$

$$=70520 \cdot$$

Correct answers: ( 1 ) 216 · ( 2 ) 1408 · ( 3 ) 26 · ( 4 ) 70520 ·