Quality inspection of the Compulsory Education Stage, Yuechi County, Autumn of 2017

7th Grade Mathematics Exam

(8 pages, five sections, full score 150 points, 120-minute exam)

Section	One	Two	Three	Four	Five	Total	Name
Full Score	40	32	30	18	30	150	
Score							

Score	Rater

One, multiple choice (10 questions, 4 points per question, full score 40 points)

1. $-\frac{1}{2}$ has an opposite reciprocal of（ ）

A. $-\frac{1}{2}$　　B. 2　　C. -2　　D. $\frac{1}{2}$

2. The highest temperature of a day was 12 degrees, with a lowest temperature of - 2. Then the total temperature difference was（ ）

A. - 10 degrees　　B.10 degrees　　C.14 degrees　　D. - 14 degrees

3. 168.2 billion written in scientific notation is（ ）

A · 1682×10^{8}　　B · 16.82×10^{9}　　C · 1.682×10^{11}　　D · 0.1682×10^{12}

4. Which of the following is correct? ( )

A. $-a$ must be a number on the number line left of the origin B. The reciprocal of a is $\frac{1}{a}$

C. The opposite number of a number must be smaller than the number D. If $|a| = -a$, then a is either negative or 0

5. Monomial - $2^3a^2b^3$ has a coefficient and degree of ( )

A · -2 · 8 B · -8 · 5 C · 2 · 8 D · -2 · 5

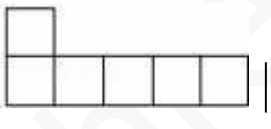
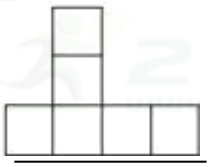
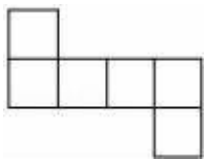
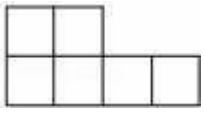
6. Which of the following calculations are correct? ( )

A · $3a+2a=5a^2$ B · 3a - a=3 C · $2a^3+3a^2=5a^5$ D · $-a^2b+2a^2b=a^2b$

7. A store sells two types of clothing for 200 dollars each, one of which makes a profit of 25% and the other loses 20%. In this transaction, the store ( )

A. Lost 10 dollars B. Gained 10 dollars C. Gained 20 dollars D. Lost 20 dollars

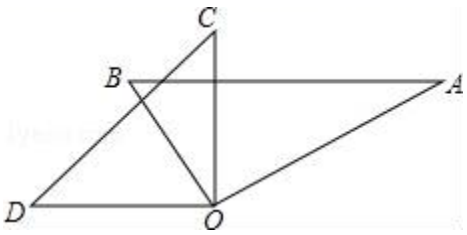
8. Which one of the following nets is a net of a cube? ( )

A ·  B ·  C ·  

9. As shown, two triangles are overlapping at point O. If ∠BOC = $\frac{1}{5}$∠AOD, then ∠BOC has a measure of ( )

A · 30°　　B · 45°

C · 54°　　D · 60°



10. Knowing that |2a+5|+|2a - 3|=8, a is equal to how many numbers? (　　)

A · 4　　B · 5　　C · 7　　D · 9

Score	Rater

Two, fill in the blanks (8 questions, 4 points per question, full score 32 points)

11. If $a+\frac{1}{2}=0$, then a^3=__ .

12. If $-\frac{1}{3}xy^2$ and $2x^{m-2}y^{n+5}$ are like terms, then n - m=__ .

13. Given that ∠α and ∠β are each other' s complementary angle, and ∠α = 35°18′23″, then ∠β=___ .

14. Given that x = 5 is the solution of ax−8=20+a, then a=___.

15. If $\left|x-\frac{1}{2}\right|+(y+2)^2=0$, then $(xy)^{2017}$ as a value of _____.

16. a,b,c,d are rational numbers. Rules $\begin{vmatrix} a & b \\ c & d \end{vmatrix}=ad-bc$, then when $\begin{vmatrix} 2 & 4 \\ (1-x) & 5 \end{vmatrix}$=18, x = _____.

17. On a straight line, there are three points A, B, and C. AB = 5cm, BC = 3cm. If point D is the midpoint of AC, then DB has a length of _____cm.

18. Observe the following patterns:

Pattern One: 4 · -9 · 16 · -25 · 36 · ...

Pattern Two: 6 · -7 · 18 · -23 · 38 · ...

The 6^{th} number of part two is ___ ; The nth is _____ .

Score	Rater

Three, short answer questions (3 question, 10 points per question, full score 30 points)

19. Calculate (5 points per problem)

(1) $30\times\left(\frac{1}{2}-\frac{2}{3}-\frac{4}{5}\right)$

$(2)\ -1^4-(1-0.5)\times\frac{1}{3}\times[1-(-2)^3]$

20. Calculate (5 points per problem)

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

(2) 1 - 3(2ab+a)+[1 - 2(2a-3ab)]

21. Solve (5 points per problem)

(1) 3x - 7(x - 1)=3 - 2(x+3)

(2) $\frac{1-x}{3}-x=3-\frac{x+2}{4}$

Score	Rater

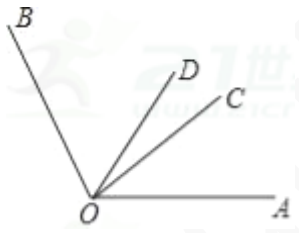
Four, comprehensive questions (6 points each for 22, 23, 24; full score 18 points)

22. First simplify, then substitute

$\left(-x^2+3xy-\frac{1}{2}y^2\right)-\left(-\frac{1}{2}x^2+4xy-\frac{3}{2}y^2\right)$, $x=2$, $y=-1$.

23. If $y = 3$ is the solution to $2+(m-y)=2y$, then what is the value of x in $2mx=(m+1)(3x-5)$?

24. As shown, given that $\angle COB = 2\angle AOC$, OD bisects $\angle AOB$, and $\angle COD=25°$, find the measure of $\angle AOB$.



Score	Rater

Five, comprehensive problems (3 questions, Problem 25 is worth 8 points, Problem 26 is worth 10 points, Problem 27 is worth 12, full score 30 points)

25. It took 2 hours for a ship to travel downstream from Harbor A to Harbor B; it took 3 hours to travel upstream from Harbor B to Harbor A. Find the average speed of the boat in still water, given that the speed of the current is 3 km/h.

26. The exercise books used by Lillian can be purchased in stores A and B. It is known that the price of the two stores is 2 dollars each. The preferential condition of store A is to buy more than 10 copies, and from the 11th book, it will be sold at 70% of the price; The preferential condition of B store is to sell at 80% of the list price from the first one.

（1）If Lillian wants to buy x exercise books（x > 10）, when she goes to shop A to buy, she pays dollars, and when she goes to shop B to buy, she pays _____ dollars;

（2）How many exercise books do both stores pay the same for?

（3）Lillian is going to buy 50 exercise books. In order to save money, how to choose which is more cost-effective?

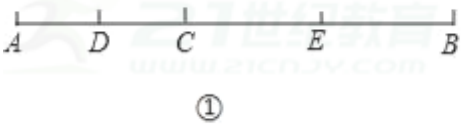
27. As shown in figure ①, the length of AB=14cm. Point C is a moving point on AB, and points D and E are each the midpoints of AC and BC.

(1) If point C is the midpoint of AB, then DE = ____cm;

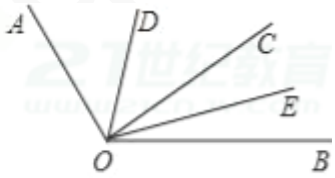
(2) If AC = 4cm, find DE;

(3) Try substituting numbers with variables, and let AC = a cm, not writing down the true value of a (a is no greater than 14cm), with the length of DE not changing;

(4) As shown in figure ②, given that ∠AOB = 120°. OD and OE each bisects ∠AOC and ∠BOC. Prove that ∠DOE = 60° and ray OC are location independent.



①



②

Answer Key

One, multiple choice (10 questions, 4 points per question, full score 40 points)

1 · B 2 · C 3 · C 4 · D 5 · B 6 · D 7 · A 8 · C 9 · A 10 · A

Two, fill in the blanks (8 questions, 4 points per question, full score 32 points)

11 · $-\frac{1}{8}$ 12 · -6 13 · 54°41′37″ 14 · a=7 15 · -1

16 · 3 17 · 4 or 1 18 · -47, $(-1)^{n+1}\cdot(n+1)^2+2$

Three, short answer questions (3 question, 10 points per question, full score 30 points)

19 · Calculation Questions (5 points per problem)

(1) S: Original Equation = $30\times\frac{1}{2}-30\times\frac{2}{3}-30\times\frac{4}{5}$ ..... 2 points

=15 - 20 - 24

= - 29 .....5 points

(2) S: Original Equation = $-1-\frac{1}{2}\times\frac{1}{3}\times9$.....2 points

= $-1-\frac{3}{2}$

= $-\frac{5}{2}$ .....5 points

20 · Calculation problems (5 points)

(1) S: Original Equation = $8x^2$ - 12x+4 - $8x^2$+4x - 6.....2 points

= - 8x - 2.....5 points

(2) S: Original Equation =1 - 6ab - 3a+ (1 - 4a+6ab)

=1 - 6ab - 3a+1 - 4a+6ab.....2 points

=2 - 7a.....5 points

21 · Solve (5 points per question)

(1) S: 3x - 7x+7=3 - 2x - 6.....2 points

3x - 7x+2x=3 - 6 - 7.....3 points

- 2x= - 10.....4 points

x=5.....5 points

(2) S: 4(1 - x) - 12x=36 - 3(x+2).....1 point

4 - 4x - 12x=36 - 3x - 6.....2 points

- 4x - 12x+3x=36 - 6 - 4 .....3 points...

- 13x=26.....4 points

x= - 2.....5 points

Four, comprehensive questions (6 points each for 22, 23, 24; full score 18 points)

22. S: Original Equation= $-x^2+3xy-\frac{1}{2}y^2+\frac{1}{2}x^2-4xy+\frac{3}{2}y^2$ .....2 points

$=-\frac{1}{2}x^2-xy+y^2$ .....3 points

When x=2 and y= - 1,

Original Equation = $-\frac{1}{2}\times2^2-2\times(-1)+(-1)^2=1$.....6 points

23 · S: When y=3 and 2+m - 3=6 , m=7 .....2 points

Substitute m=7 into the function 2mx=(m+1)(3x - 5) and simplified, you get: 14x=8(3x - 5)

14x=24x - 40.....4 points

14x - 24x= - 40

- 10x= - 40

x=4.....6 points

24 · S: Let ∠AOC=x

∴∠COB=2∠AOC=2x

∠AOB=BOC+∠AOC=3x

And ∵OD bisects ∠AOB

∴∠AOD=$\frac{1}{2}$∠AOB=$\frac{3}{2}$x.....2 points

And ∵∠COD=∠AOD-∠AOC

$\therefore \frac{3}{2}$x - x=25°.....3 points

x=50° .....5 points

∴∠AOB=3×50°=150° .....6 points

Five, comprehensive problems (3 questions, Problem 25 is worth 8 points, Problem 26 is worth 10 points, Problem 27 is worth 12, full score 30 points)

25 · S: Let the speed of the boat in still water be x kilometers per hour.....1 point

2（x+3）=3(x - 3).....4 points

2x+6=3x - 9

x=15.....7 points

A: The speed of the ship in still water is 15 kilometers per hour.....8 points

26 · S:（1）10×2+（x - 10）×2×0.7 , 2x×0.8.....2 points

（2）10×2+（x - 10）×2×0.7= 2x×0.8 .....4 points

20+1.4x - 14=1.6x

x=30 .....6 points

A: When buying 30 books, costs of both stores are the same .....7 points

（3）When buying 50 books,

Shop A costs: $10\times2+(50-10)\times2\times0.7=76$ dollars .....8 points

Shop B costs: $50\times2\times0.8=80$ dollars .....9 points

$\because 76<80$ $\therefore$Shop A is more cost-efficient.....10 points

27 · S: (1) 7.....2 points

(2) $\because AC=4cm$

$\therefore BC=AB-AC=10cm$

And $\because$D is the midpoint of AC, E is the midpoint of BC

$\therefore CD=2cm, CE=5cm$

$\therefore DE=CD+CE=7cm$.....5 points

(3) $\because AC=acm$

$\therefore BC=AB-AC=(14-a)cm$

And $\because$D is the midpoint of AC, E is the midpoint of BC

$\therefore CD=\frac{a}{2}cm, CE=\frac{14-a}{2}cm$

$\therefore DE=CD+CE=\frac{a}{2}+\frac{14-a}{2}=\frac{a+14-a}{2}=7cm$

$\therefore$No matter what value a takes, (not greater than 14), the length of DE doesn't change.....8 points

(4) Let ∠AOC=α,∠BOC=120-α

∵OD bisects ∠AOC,OE bisects ∠BOC

$\therefore \angle COD=\frac{\alpha}{2}$, $\angle COE=\frac{120^o-\alpha}{2}$

$\therefore \angle DOE=\angle COD+\angle COE=\frac{\alpha}{2}+\frac{120^o-\alpha}{2}=\frac{\alpha+120^o-\alpha}{2}$

=60°

∴∠DOE=60° and OC are location independent .....12 points