MIDTERM EXAM

Topics 4.1–4.5

Student Name: _____

Teacher: _____

Date: _____

Time Allowed: 2 Hours 30 Minutes **Total Points: 100**

Instructions

- Write clearly and show all work to receive full credit.
- Box your final answers.
- No unauthorized materials unless stated otherwise.

GRADING

Problem	1	2	3	4	5	6	7	Total
Points	40	10	10	10	10	10	10	100
Score								

Good luck! Read each question carefully before answering.

Section 1: Multiple Choice (Calculator NOT Allowed)

Rules / Instructions

- **No calculator.**
- This section contains **24 multiple-choice questions**. **Each question is worth 1 point.**
- Read all questions carefully and select the **one best answer**.
- Clearly mark your choice: **A, B, C, D, or E**.
- Use the blank space to show work if needed.

1. (1 pt) Which of the following is a solution to the equation

$$\$4.10 = \$6.70 - y?$$

   A. $y = \$2.60$

   B. $y = \$2.50$

   C. $y = \$10.60$

   D. $y = \$10.80$

2. (1 pt) Which of the following statements is true regarding this equation:

$$36 \div x = 4?$$

   A. $x = 6$ is a solution

   B. $x = 9$ is not a solution

   C. $x = 10$ is a solution

   D. $x = 7$ is not a solution

3. (1 pt) Omer's dad rode his bike a distance of 120 miles in 8 hours. Ahmed rode his bike a distance of 120 miles in 7.5 hours. Omer rode his bike at 20 mph for y hours. Which of the following statements is true?

   A. The equation to best represent Omer is $120 \div y = 20$.

   B. Omer will take a longer time to ride 120 miles than both his dad and Ahmed.

   C. Omer will take a shorter time than his dad but a longer time than Ahmed.

   D. The equation to best represent Omer is $120 \times y = 20$.

E. Omer will take 6.5 hours to ride 120 miles.

4. (1 pt) Which of the following equations has a solution of 9?

   A. $x + 9 = 16$
   B. $x - 10 = 11$
   C. $x \div 9 = 1$
   D. $x \cdot x = 89$
   E. $x - 3 = 2$

5. (1 pt) How many solutions does $x - x = 0$ have?

   A. None
   B. One
   C. Two
   D. Three
   E. Infinitely many

6. (1 pt) If I have \$67.50 and I have bought 3 objects for \$4.50, \$15.40, and \$25.00, what is the most expensive item I could buy?

   A. Nothing
   B. \$22.50
   C. \$22.60
   D. \$22.70
   E. \$22.80

7. (1 pt) What is a mathematical sentence that uses an equal sign to show that two expressions are equal?

   A. Variable
   B. Expression
   C. Equal sign
   D. Equality
   E. Equation

8. (1 pt) Assume that there is a budget of \$31, and there are 4 people. Which equation best represents the cost they can afford without going over budget, assuming that n is the number of people?

   A. $6n + 8$
   B. $6n + 7$
   C. $5n + 16$
   D. $40 - 4n$

9. (1 pt) What property of equality was used here?

$$\frac{n}{6} = 9 \rightarrow \left(\frac{n}{6}\right) \times 5 = 9 \times 5$$

   A. Addition
   B. Subtraction
   C. Multiplication
   D. Division

10. (1 pt) Which equation is equivalent to $t - 11 = 13$?

   A. $t - 9 = 13 + 2$
   B. $5t - 11 = 5(13)$
   C. $\dfrac{t - 11}{4} = 3.5$
   D. $t + 11 = 13 + 11$

11. (1 pt) Which of the following is true regarding $14x = 56$?

   A. $14x + 3 = 59$ is not equivalent.
   B. $28x = 112$ is equivalent.
   C. $\dfrac{14x}{2} = \dfrac{56}{2}$ is not equivalent.
   D. $14x - 7 = 56 + 7$ is equivalent.
   E. None of the above is true.

Questions 12 to 16 will be based on the following scenario.
There is a balanced scale. On the left side, there are 24 green blocks. On the right side, there are x blue blocks. Assume that one blue block weighs 3 grams and one green block weighs 1 gram.

12. (1 pt) What equation will best represent the scenario?

    A. $24 \times 3 = x$
    B. $\frac{x}{3} = 24$
    C. $\frac{3}{24} = x$
    D. $3x = 24$

13. (1 pt) Solve for the value of x.

    A. $x = 72$
    B. $x = 24$
    C. $x = 20$
    D. $x = 9$
    E. $x = 8$

14. (1 pt) Let's say there are 48 green blocks on the left side and 16 blue blocks on the right side, and the scale is balanced. If I remove 12 green blocks, how many blue blocks must I remove?

    A. $\frac{1}{4}$ of the blue blocks
    B. $\frac{1}{3}$ of the blue blocks
    C. $\frac{1}{2}$ of the blue blocks
    D. 6 blue blocks
    E. 3 blue blocks

15. (1 pt) If I add y green blocks to the left side, how many blue blocks should I add to the right side?

    A. $\frac{y}{3}$ blue blocks
    B. y blue blocks
    C. $3y$ blue blocks

D. $y + 3$ blue blocks

16. (1 pt) Let's say there are 48 green blocks on the left side and 16 blue blocks on the right side, and the scale is balanced. If I add an orange block that is 15 grams to the left side, how many blue blocks should I add to the right side?

    A. 3

    B. 4

    C. 5

    D. 6

    E. 7

17. (1 pt) Which of the following correctly shows the inverse relationship between two operations?

    A. Multiplication and Addition

    B. Addition and Division

    C. Division and Subtraction

    D. Subtraction and Addition

18. (1 pt) Which of the following equations has the same solution as $20 = x - 7$?

    A. $x + 9 = 36$

    B. $x - 7 = 13$

    C. $x + 13 = 26$

    D. $x - 20 = 27$

19. (1 pt) What should be the first step in solving the equation: $130 = g - 37$?

    A. Addition Property of Equality

    B. Subtraction Property of Equality

    C. Multiplication Property of Equality

    D. Division Property of Equality

20. (1 pt) Which of the following is a solution to $7 + 3y = 25 - 6y$?

A. $y = 1$

B. $y = 2$

C. $y = 3$

D. $y = 4$

Questions 21 to 24 will be based on the following scenario. There are 150 items on the shelf. The first table shows the number of items on the shelf. The second table shows the last orders from the store.

Items	**In Stock**
Notebooks	37
Pens	35
Folders	X
Staplers	Y
Item A	Z

Items	**Number Orders**
Erasers	0–10
Highlighters	11–20
Markers	21–30
Rulers	31–40

21. (1 pt) Which of the following equations best represents the scenario?

A. $37 + 35 = 150 + X + Y + Z$

B. $150 = 37 + 35 - X - Y - Z$

C. $150 = 37 + 35 + X + Y + Z$

D. $150 - X - Y - Z = 37 - 35$

22. (1 pt) Which of the following is true about $X + Y + Z$?

A. $X + Y + Z = 70$

B. $X + Y + Z = 78$

C. $X + Y + Z = 88$

D. $X + Y + Z = 90$

23. (1 pt) If there are 30 folders and 19 staplers, which of the following equations can be used to find the number of Item A in stock?

    A. $150 = 37 + 35 + 30 + 19 - Z$

    B. $Z = 70 - Y - X$

    C. $Z = 78 - Y - X$

    D. $Z = 88 - Y - X$

    E. $Z = 80 - Y - X$

24. (1 pt) After finding the number of items Z, which of the following could be Item A using the store's last orders?

    A. Erasers

    B. Highlighter

    C. Marker

    D. Ruler

Section 1: Multiple Choice (Calculator Allowed)

Rules / Instructions

- **Calculator is allowed** for this section.
- Each question is worth **1 point**.
- Read each question carefully and select the **one best answer**.
- Clearly circle/mark your choice: **A, B, C, D, or E**.

25. (1 pt) Omer typed 13,500 words in 2 hours and 30 minutes. How many words did Omer type per minute?

    A. 50

    B. 60

    C. 75

    D. 90

    E. 100

26. (1 pt) Bill made \$1750 this week. If he gets paid \$25 an hour, how many hours did he work this week?

    A. 50

    B. 60

    C. 70

    D. 80

    E. 90

27. (1 pt) There is a group of x people. Which of the following is true?

    A. If I can break the group into two, x is odd.

    B. If I can break the group into three, x is even.

    C. If I can break the group into four, x is even.

    D. If I break the group into 5, x is odd.

Questions 28–31 are based on the following scenario.
Below are the prices of the different team jerseys.

Team	Cost
A	\$11
B	\$9
C	\$15
D	\$12

28. (1 pt) Which equation correctly represents T, the total sales amount for all jerseys, where a, b, c, d are the numbers sold for Teams A, B, C, D?

    A. $11 + 9 + 15 + 12 + a + b + c + d = T$

    B. $11a + 9b + 15c + 12d = T$

    C. $T = 11a - 9b - 15c - 12d$

    D. $a + b + c + d = T$

29. (1 pt) A company budget is \$300. If they bought 7 jerseys from Team A and 7 from Team B, which scenario shows how many jerseys they can buy from Team C and Team D without going over budget?

    A. 10 from Team C and none from Team D

    B. 7 from Team C and 5 from Team D

    C. 9 from Team C and 3 from Team D

    D. None from Team C and 15 from Team D

30. (1 pt) If I bought jerseys from only one team and paid \$204 with no change, what team did I buy them from?

    A. Team A

    B. Team B

    C. Team C

    D. Team D

31. (1 pt) I spent \$121 on jerseys from Team A, \$90 on jerseys from Team B, and \$165 on jerseys from Team C. If I bought a total of 40 jerseys, how much did I spend on Team D's jerseys?

    A. \$84

    B. \$96

    C. \$108

    D. \$120

    E. \$132

32. (1 pt) There is a trapezoid with bases $b_1 = 10$ and $b_2 = 5$. If the area is $A = 30$, what is the height h? Use $A = \frac{1}{2}(b_1 + b_2)h$.

    A. 1

    B. 2

    C. 3

    D. 4

    E. 5

33. (1 pt) Which value of y makes $0.67y = 1.407$ true?

    A. $y = 21$

    B. $y = 2.1$

    C. $y = 0.21$

    D. $y = 0.021$

34. (1 pt) Which value of x makes $0.502 + x = 0.9$ true?

    A. 0.398

    B. 0.400

    C. 0.402

    D. 0.408

    E. 0.412

35. (1 pt) Which value of z makes $\frac{1}{8}z = 4$ true?

    A. 8

    B. 16

    C. 32

    D. 64

36. (1 pt) If the area of the rectangle is 4 ft^2 and the length is $\frac{7}{8}$ ft, what is the width?

    A. $\frac{30}{4}$

    B. $\frac{32}{4}$

    C. $\frac{32}{7}$

    D. $\frac{21}{8}$

    E. $\frac{21}{4}$

37. (1 pt) The area of a triangle is 15.3 cm^2 and the base is 4.5 cm. Using $A = \frac{1}{2}bh$, what is the height?

    A. 0.068

    B. 0.069

    C. 0.6

    D. 6.8

    E. 6.7

38. (1 pt) Which of the following is true regarding $\frac{a}{b} \cdot m = 2$?

    A. The greater the a, the greater the solution.

    B. The greater the b, the smaller the solution.

    C. The smaller the a, the greater the solution.

    D. The smaller the b, the greater the solution.

39. (1 pt) If I walk $\frac{7}{8}$ miles to school, how many miles do I walk for 5 days from school and back home?

    A. $\frac{34}{4}$ miles

    B. $\frac{35}{4}$ mile

    C. $\frac{36}{4}$ miles

D. $\frac{37}{4}$ miles

E. $\frac{38}{4}$ miles

40. (1 pt) A fraction f multiplied by 7 equals $\frac{1}{8}$. What is the value of f?

A. $\frac{1}{7}$

B. $\frac{7}{8}$

C. $\frac{1}{56}$

D. $\frac{1}{64}$

E. $\frac{8}{7}$

Section 2: Multi-Select (Calculator NOT Allowed)

Instructions

- **No calculator.**
- This section contains **multi-select questions**.
- **Each question is worth 1 point.**
- **Select all answers that apply.** More than one option may be correct.
- Clearly mark your answers by checking the boxes.

1. (1 pt) Select all of the values of d that make the equation $9 = \frac{18}{d}$ true.

   ☐ 2

   ☐ 0.5

   ☐ $\frac{10}{5}$

   ☐ $\frac{1}{4}$

   ☐ $\frac{1}{2}$

2. (1 pt) Select all of the values of w that make the equation $6w + 3 = 4w + 15$ true.

   ☐ 0

   ☐ 6

   ☐ $\frac{12}{2}$

   ☐ 4

   ☐ $\frac{36}{6}$

3. (1 pt) Select all equations that are equivalent to $n - 9 = 12$.

   ☐ $n - n - 9 = 12 - n$

   ☐ $n - 9 + 12 = 12 - 9$

   ☐ $n - 9 + 9 = 12 + 9$

   ☐ $n - 9 - n = 12 - n$

   ☐ $n - 9 + 9 = 12 - 12$

4. (1 pt) Which of the equations is **NOT** equivalent to $8p = 12$? Select all that apply.

   - ☐ $8p \div 8 = 12 \div 8$
   - ☐ $8p \div 8 = 12 \div 12$
   - ☐ $8p + 4 = 12 + 4$
   - ☐ $8p - 2 = 12 - 2$
   - ☐ $8p \times 8 = 12 \times 12$

5. (1 pt) Select all equations that have the same solutions as $36 = x + 32$.

   - ☐ $42 = 38 + x$
   - ☐ $x + 15 = 19$
   - ☐ $18 = x - 2$
   - ☐ $36 = x - 32$
   - ☐ $52 - x = 46$

6. (1 pt) Which equations have $y = 5$ as the solution?

   - ☐ $y + 2 = 7$
   - ☐ $y - 2 = 3$
   - ☐ $20 + y = 25$
   - ☐ $20 - y = 14$
   - ☐ $5 - y = 5$

7. (1 pt) Which equations have $x = 3$ as the solution?

   - ☐ $3x - 4 = 3$
   - ☐ $9 - 2x = 3$
   - ☐ $5x + 3 = 15$
   - ☐ $9x - 5x = 12$
   - ☐ $\frac{x}{3} = 2$

8. (1 pt) Which equations have $t = 0$ as the solution?

- ☐ $t - t = 0$
- ☐ $5t = 0$
- ☐ $4t - 3 = 0$
- ☐ $2t = 2$
- ☐ $t - 0 = 0$

9. (1 pt) Select all equations that have the same solutions as $\frac{7}{8}x = \frac{1}{4}$.

- ☐ $7x = 2$
- ☐ $x - \frac{1}{7} = \frac{2}{7}$
- ☐ $x + \frac{7}{8} = 1$
- ☐ $1 - x = \frac{5}{7}$
- ☐ $x \times \frac{7}{2} = 1$

10. (1 pt) Which equations have $p = 0.5$ as the solution?

- ☐ $2p = 1$
- ☐ $4p - 2 = 0$
- ☐ $\frac{1}{2}p = \frac{1}{4}$
- ☐ $1.536 - p = 1.036$
- ☐ $p - \frac{1}{4} = 0.30$

Section 3–7: Short Answer

No Calculator

Answer each question **clearly and fully**. Show all necessary work and justify your reasoning.

Each question is worth 10 points.

You may use the **back page** as scratch work, but your **final answer must appear on the page where the question is stated**.

3. **(10 pts)** Write **four equations** using the variable x such that the solution is

$$x = \frac{5}{6}.$$

Each equation must use a different operation: $+$, $-$, $\times$, and $\div$. Verify that $x = \frac{5}{6}$ satisfies each equation.

4. **(10 pts)** Below are two incomplete proofs. Complete the missing steps.

Proof 1

1. $7x - 3 = 9$
2. $7x - 3 + 3 = 9 + 3$ _____
3. $7x = 9$
4. $\frac{7x}{7} = \frac{9}{7}$ _____
5. $x = \frac{9}{7}$

Proof 2

1. $20 - y = 15$
2. _____ (Addition Property of Equality)
3. $20 = 15 + y$
4. _____ (Subtraction Property of Equality)
5. $5 = y$

5. **(10 pts)** A parcel is dropped from a helicopter at a height of 1300 meters. It falls a distance of x meters and lands in the sea, which is 200 meters below sea level.

   - Write an equation to represent the situation.
   - Solve for x.

   Hint: Positions below sea level should be considered negative (use -200).

6. **(10 pts)** John is 2 times as old as Sally in 2025. After 5 years, John is 35 years old.

   - Let Sally's age in 2025 be s.
   - Write an equation.
   - Solve for s.

   What is Sally's age in 2025?

7. **(10 pts)** A statue has a length of $5\frac{3}{7}$ feet. If the statue is $\frac{3}{4}$ complete, how much of the statue is complete, in feet?

   Show all work.