

NO CALCULATORS

## ALGEBRAIC WORD PROBLEMS – TEAM EVENT

Pitt State Math Relays — 2023

### TEAM MEMBER #1

Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

1. One angle of a triangle is four times the smallest angle and the third angle is  $36^\circ$  more than the smallest angle. What is the measure of the largest angle?

- (A)  $96^\circ$       (B)  $60^\circ$       (C)  $144^\circ$       (D)  $24^\circ$       (E) none of these

2. Susie can type 4 pages in 20 minutes. How many pages can she type in 50 minutes?

- (A) 10      (B) 11      (C) 30      (D) 12      (E) none of these

3. Thursday Tom bought two cups of coffee and one muffin for \$4.40. Friday he bought one cup of coffee and two muffins for \$3.55. What does a coffee cost?

- (A) under \$1      (B) between \$1 and \$1.50      (C) between \$1.50 and \$2      (D) over \$2

4. A car tire has a leak and the formula  $P(t) = 39(3^{-0.25t})$  gives the tire pressure in pounds per square inch after  $t$  minutes. After how many minutes is the pressure 13 pounds per square inch?

- (A)  $\frac{4}{5}$       (B) 60      (C) 4      (D) 5      (E) none of these

5. \$10,000 was inherited with the requirement that for the first year the money had to be invested in two accounts paying 6% and 11% annual interest, respectively. How much was invested at 11% if the total interest earned for the year was \$700?

- (A) \$8000      (B) \$7000      (C) \$3500      (D) \$2000      (E) none of these

6. Assume we are animating a video game and want to move a character in a straight line from the point  $A = (1, 2)$  to the point  $B = (5, 0)$ . Where is the character when it is 90% of the way along?

- (A) (6, 2)      (B) (3.6, 1.8)      (C) (5.1, 0.2)      (D) (4.6, 0.2)      (E) none of these

7. A store owner wants to enclose an empty lot for parking. She has 236 feet of fencing and will leave the side facing the street unfenced. What is the largest rectangular area that can be fenced in?

- (A)  $3481 \text{ ft}^2$       (B)  $6962 \text{ ft}^2$       (C)  $10,443 \text{ ft}^2$       (D)  $13,924 \text{ ft}^2$       (E) none of these

8. Two rental companies offer the same car at different rates. The first company charges a daily rate of  $A(m) = 35 + 0.15m$  dollars to drive  $m$  miles. The second company charges a daily rate of  $B(m) = 50 + 0.1m$  dollars to drive  $m$  miles. What is the breakeven mileage for these two companies?

- (A) 500      (B) 300      (C) 145      (D) 50      (E) none of these

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### TEAM MEMBER #2

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9. Assume we are animating a video game and want to move a character in a straight line from the point  $A = (1, 2)$  to the point  $B = (5, 0)$ . Where is the character when it is 90% of the way along?

- (A) (6, 2)      (B) (3.6, 1.8)      (C) (5.1, 0.2)      (D) (4.6, 0.2)      (E) none of these

10. Monday I bought two cups of coffee and one muffin for \$4.40. Tuesday I bought one cup of coffee and two muffins for \$3.55. What does a coffee cost?

- (A) under \$1      (B) between \$1 and \$1.50      (C) between \$1.50 and \$2      (D) over \$2

11. \$10,000 was inherited with the requirement that for the first year the money had to be invested in two stocks paying 6% and 11% annual interest, respectively. How much was invested at 11% if the total interest earned for the year was \$700?

- (A) \$8000      (B) \$7000      (C) \$3500      (D) \$2000      (E) none of these

12. Jorge can type 4 pages in 20 minutes. How many pages can he type in 50 minutes?

- (A) 10      (B) 11      (C) 30      (D) 12      (E) none of these

13. A car tire has a leak and the formula  $P(t) = 39(3^{-0.25t})$  gives the tire pressure in pounds per square inch after  $t$  minutes. After how many minutes is the pressure 13 pounds per square inch?

- (A)  $\frac{4}{5}$       (B) 60      (C) 4      (D) 5      (E) none of these

14. A restaurant owner wants to enclose an empty lot for parking. She has 236 feet of fencing and will leave the side facing the street unfenced. What is the largest rectangular area that can be fenced in?

- (A) 3481 ft<sup>2</sup>      (B) 6962 ft<sup>2</sup>      (C) 10,443 ft<sup>2</sup>      (D) 13,924 ft<sup>2</sup>      (E) none of these

15. The decibel rating of a sound is given by  $B(I) = 10 \log_{10} \left( \frac{I}{10^{-12}} \right)$ , where  $I$  is the intensity of the sound measured in watts per square meter ( $W / m^2$ ). The decibel rating of a sound with intensity 100 ( $W / m^2$ ) is

- (A) 220      (B) 25      (C) 100      (D) 140      (E) none of these

16. Two rental companies offer the same car at different rates. The first company charges a daily rate of  $A(m) = 35 + 0.15m$  dollars to drive  $m$  miles. The second company charges a daily rate of  $B(m) = 50 + 0.1m$  dollars to drive  $m$  miles. What is the breakeven mileage for these two companies?

- (A) 500      (B) 300      (C) 145      (D) 50      (E) none of these

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### TEAM MEMBER #3

Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

17. A book is opened. The sum of the page numbers on the facing pages is 281. What is the larger page number?

- (A) 200      (B) 140      (C) 141      (D) 199      (E) none of these

18. If the perimeter of a rectangle is 36 feet and one side is 8 feet, the area of the rectangle is

- (A) 9 sq. feet      (B) 80 sq. feet      (C) 64 sq. feet      (D) 288 sq. feet      (E) none of these

19. A collection of coins has nickels, dimes and quarters. The number of nickels is three times the number of quarters, and there are one-half as many dimes as nickels. The total collection is valued at \$3.30. Find the number of quarters in the collection.

- (A) 6      (B) 9      (C) 18      (D) 1      (E) none of these

20. A gaming company hired a market researcher to find out how to price a new video game app. The researcher reported that if the app costs \$5, then 8000 people a month will buy it, but if it costs \$10, then 4000 people a month will buy it. What is the lowest price at which nobody will buy the app?

- (A) \$100      (B) \$38      (C) \$21.25      (D) \$15      (E) none of these

21. A word processor determines the width of the body of text on a page for a margin of  $x$  inches. If the page is 7.25 inches wide with equal side margins, the width of the body of text is given by

- (A)  $7.25 - 2x$       (B)  $2x + 7.25$       (C)  $7.25 - x$       (D)  $2x - 7.25$       (E) none of these

22. Mark has made 20 out of 35 free throws so far this basketball season. He wants to end the season with at least a 70% average. If he has 25 more attempts in the rest of the season, how many successful free throws must he make?

- (A) 22      (B) 25      (C) 13      (D) 10      (E) none of these

23. On Monday, Tuesday and Wednesday, a total of 115 books are sold. On Monday and Friday, a total of 70 books are sold. On Tuesday and Thursday, a total of 90 books are sold. On Wednesday and Thursday, a total of 85 books are sold. On Thursday and Friday, a total of 80 books are sold. Find the number of books sold on Tuesday.

- (A) 50      (B) 45      (C) 40      (D) 24      (E) none of these

24. The ratio of pink marbles to purple marbles in a box is two to five. Ten purple marbles are added to the box. How many pink marbles must be added to keep the ratio the same?

- (A) 10      (B) 4      (C) 30      (D) 2      (E) none of these

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## TEAM MEMBER #4

Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

25. The ratio of blue marbles to green marbles in a box is two to five. Ten green marbles are added to the box. How many blue marbles must be added to keep the ratio the same?

- (A) 2            (B) 4            (C) 30            (D) 10            (E) none of these

26. Mark has made 20 out of 35 free throws so far this basketball season. He wants to end the season with at least a 70% average. If he has 25 more attempts in the rest of the season, how many successful free throws must he make?

- (A) 24            (B) 22            (C) 13            (D) 10            (E) none of these

27. A word processor determines the width of the body of text on a page for a margin of  $x$  inches. If the page is 7.25 inches wide with equal side margins, the width of the body of text is given by

- (A)  $7.25 - x$             (B)  $2x + 7.25$             (C)  $7.25 - 2x$             (D)  $2x - 7.25$             (E) none of these

28. A book is opened. The sum of the page numbers on the facing pages is 281. What is the larger page number?

- (A) 142            (B) 140            (C) 141            (D) 199            (E) none of these

29. A collection of coins has nickels, dimes and quarters. The number of nickels is three times the number of quarters, and there are one-half as many dimes as nickels. The total collection is valued at \$3.30. Find the number of quarters in the collection.

- (A) 1            (B) 6            (C) 18            (D) 1            (E) none of these

30. The decibel rating of a sound is given by  $B(I) = 10 \log_{10} \left( \frac{I}{10^{-12}} \right)$ , where  $I$  is the intensity of the sound measured in watts per square meter ( $W / m^2$ ). The decibel rating of a sound with intensity 100 ( $W / m^2$ ) is

- (A) 25            (B) 220            (C) 100            (D) 140            (E) none of these

31. \$10,000 was inherited with the requirement that for the first year the money had to be invested in two stocks paying 6% and 11% annual interest, respectively. How much was invested at 11% if the total interest earned for the year was \$700?

- (A) \$2000            (B) \$7000            (C) \$3500            (D) \$8000            (E) none of these

32. A class of 50 students is divided into two groups; one group has eight less than the other; how many are in the larger group?

- (A) 20            (B) 25            (C) 29            (D) 42            (E) none of these