

**O.S.S.T.F. District 10
MATHEMATICS CONTEST**

For Grades 9, 10 and 11

Wednesday, April 24, 1963. 9-10 a.m.

Sponsored by The University of Waterloo.

INSTRUCTIONS:

- (1) The minimum number of contestants from each school will be THREE and maximum will be THIRTY.
- (2) The writing time for the contest will be exactly one hour.
- (3) This is a multiple choice test. Each question is followed by 5 answers marked A,B,C,D, and E. For each question write an X in the correct box corresponding to the letter of the correct answer. (not shown here).
- (4) AVOID GUESSING BECAUSE INCORRECTLY-GUESSED ANSWERS ARE PENALIZED.
- (5) There are 3 parts to the contest. Each part is ranked as stipulated.

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NAME _____

SCHOOL _____

GRADE _____ AGE _____

- - - - -

Not to be filled in by the student.

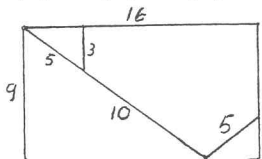
	Value	Points Correct, C	Points Wrong, W (not omissions)
Part 1	3 points each	3 times =	3 times =
Part 2	4 points each	4 times =	4 times =
Part 3	5 points each	5 times =	5 times =
TOTALS:			
SCORE: $C - \frac{1}{4} W$ equals:			

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PART 1 (3 credits each)

1. $\frac{3}{4} + \frac{2}{5} \div \frac{4}{7} - 1$ equals: (A) $\frac{9}{20}$ (B) $\frac{1}{20}$ (C) 2 (D) $\frac{81}{80}$ (E) $-\frac{1}{20}$
2. If 100 soldiers eat 100 dozen eggs in two weeks, how long does it take 400 soldiers to eat 400 dozen eggs?
(A) 1 week (B) 2 weeks (C) 3 weeks (D) 4 weeks (E) one-half week
3. Which of the following numbers is not greater than $-\frac{5}{12}$?
(A) $-\frac{2}{5}$ (B) 0 (C) $\frac{1}{10}$ (D) $-\frac{7}{16}$ (E) .4166
4. The quantity which when divided by $2x + 4$ gives a quotient of $x - 2$ and remainder 9 is:
(A) $2x^2 - 8$ (B) $2x^2 + x + 8$ (C) $2x^2 - x + 1$ (D) $2x^2 + 4$ (E) $2x^2 + 1$
5. If I buy 20 lb. of nails at $3a$ cents per lb. and 10 lb. at $6b$ cents per lb., the average cost per lb. in cents, is:
(A) $a + b$ (B) $2a + b$ (D) $60a + 60b$ (E) $2a + 2b$
6. If a 3 foot stake casts a shadow 7 feet long, then the height of a tree which casts a shadow 63 feet long is:
(A) 18 ft. (B) 21 ft. (C) 24.5 ft. (D) 27 ft. (E) 30.5 ft.
7. If $\frac{a}{b} = \frac{3}{4}$, $\frac{b}{c} = \frac{8}{9}$, and $\frac{c}{d} = \frac{2}{3}$, then $\frac{a}{d}$ is equal to:
(A) $\frac{13}{16}$ (B) $\frac{4}{9}$ (C) $\frac{9}{4}$ (D) $\frac{16}{13}$ (E) none of these
8. If n is an integer, then which of the following is always an odd integer?
(A) $n - 1$ (B) $2n + 1$ (C) n^3 (D) $3n$ (E) $2n$
9. A calendar 'h' inches long is designed with a picture 'a' inches by 'b' inches and a calendar pad 'c' inches by 'd' inches. The picture and the pad together take up one-half the area of the calendar. The calendar's width in inches is:
(A) $\frac{2ab + 2dc}{h}$ (B) $\frac{ab + dc}{2h}$ (C) $2h(ab + dc)$ (D) $\frac{ab + dc}{h}$ (E) $2(ab + dc)$
10. In triangle ABC the bisectors of angles B and C meet at E. If the number of degrees in angle A is 'x', then angle BEC in degrees is represented by:
(A) $90 - x$ (B) $90 + \frac{x}{2}$ (C) $180 - x$ (D) $2x$ (E) $180 - \frac{x}{2}$
11. A fisherman has 6 different trout flies. How many selections of two flies each can he make?
(A) 30 (B) 3 (C) 6 (D) 15 (E) 21

12. A dime is placed on a table. The number of dimes which can be placed around it, tangent to it and two others is:
 (A) 4 (B) 5 (C) 6 (D) 8 (E) 12

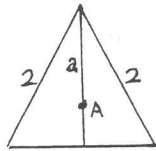
13.  When the 16 by 9 rectangle in the diagram is cut in the manner shown, the pieces can form a square of perimeter:
 (A) 50 (B) 48 (C) 32 (D) 40 (E) 36

14. A man buys a package of 25 cigarettes, and on smoking them, saves the butts. From every 4 butts he can make a complete cigarette. Thus from one package the number of whole cigarettes he can get is:
 (A) 25 (B) 31 (C) 30 (D) 32 (E) 33

PART 2 (4 credits each)

15. Charles had $5q + 1$ quarters and Richard had $q + 5$ quarters. The difference in their money, measured in dimes, is:
 (A) $10(q - 1)$ (B) $\frac{2}{5}(4q - 4)$ (C) $\frac{2}{5}(q - 1)$ (D) $\frac{5}{2}(q - 1)$ (E) $4(q - 1)$
16. The simplest form of $1 - \frac{1}{1 + \frac{a}{1 - a}}$ is:
 (A) a if $a \neq 0$ (B) 1 (C) a if $a \neq 1$ (D) a if $a \neq -1$ (E) $1 - a$, no restriction on a
17. The smaller angle between the hands of a clock at 12:25 is:
 (A) $132\frac{1}{2}$ deg. (B) $137\frac{1}{2}$ deg. (C) 150 deg. (D) 137 deg. (E) none of these
18. An automobile travels $a/6$ feet in ' r ' seconds. If this rate is maintained for 3 minutes, how many yards does it travel in the 3 minutes?
 (A) $\frac{a}{1080r}$ (B) $\frac{30r}{a}$ (C) $\frac{30a}{r}$ (D) $\frac{10r}{a}$ (E) $\frac{10a}{r}$
19. In triangle ABC angle A is smaller than angle B. The altitude to the base A divides the vertex angle C into parts C_1 and C_2 , with C_2 adjacent BC. Then:
 (A) $C_1 + C_2 = A + B$ (B) $C_1 - C_2 = B - A$ (C) $C_1 - C_2 = A - B$ (D) $C_1 - C_2 = A + B$
 (E) $C_1 + C_2 = B - A$
20. A bathtub will empty at a uniform rate in 15 minutes; with the plug in, it will fill at a uniform rate in 12 minutes. How long will it take to fill if the plug is removed and the tap turned on?
 (A) 30 min. (B) 60 min. (C) 80 min. (D) 90 min. (E) 120 min.
21. In our number system the base is ten. If the base was changed to four, you would count as follows: 1,2,3,10,11,12,13,20,21,22,23,30, . . . etc. Then the twentieth number would be:
 (A) 20 (B) 38 (C) 44 (D) 104 (E) 110

22.



An equilateral triangle has sides equal to 2 units; a point A is taken 'a' units along an altitude. The sum of the perpendiculars drawn from A to the three sides

is:

- (A) $\sqrt{3} - \frac{a}{2}$ (B) $\sqrt{3} + \frac{a}{2}$ (C) $\sqrt{3} + 1$ (D) $\sqrt{3} + a$ (E) $\sqrt{3}$

23. If $y = a^x$, then $\log_a y = x$. Using this rule, the value of $\log_3 81$ is:

- (A) 81 (B) 3 (C) 4 (D) 27 (E) 243

24. If a point travels from A(-3,4) to B(-5,-6), the distance AB on the graph is:

- (A) $2\sqrt{41}$ (B) $2\sqrt{26}$ (C) 164 (D) 104 (E) none of these

25. Mr. Jones sold 2 pipes at \$1.20 each. Based on the cost, the profit on one was 20% and the loss on the other was 20%. On the sale of the pipes he:

- (A) broke even (B) lost 4¢ (C) gained 4¢ (D) lost 10¢ (E) gained 10¢

26. If $\frac{1}{x} - \frac{1}{y} = \frac{1}{z}$, then z is: (A) $y - x$ (B) $x - y$ (C) $\frac{y - x}{xy}$ (D) $\frac{xy}{y - x}$ (E) $\frac{xy}{x - y}$

PART 3 (5 credits each)

27. The sides of a triangle are 20,21,29. The shortest distance from the longest side to the opposite vertex is:

- (A) $\frac{400}{29}$ (B) $\frac{410}{29}$ (C) $\frac{420}{29}$ (D) $\frac{580}{21}$ (E) $\frac{609}{20}$

28. When riding on a train a person often listens to the click of the rails as the wheels pass over their joints. If the rails are each 30 feet long, for how many seconds must a person count clicks in order that the number of clicks counted will exactly equal the measure of the speed of the train in miles per hour?

- (A) 60 (B) 176 (C) 30 (D) $\frac{225}{11}$ (E) 120

29. The roots of $x^2 + px + q = 0$ are 5 and -2. Then p and q are equal to:

- (A) -3 and -10 (B) 3 and 10 (C) -3 and 10 (D) 3 and -10 (E) ± 3 and ± 10

30. Two astronauts Pat and Mike were orbiting the earth in separate space capsules. They were orbiting in the same direction and in the same plane. Pat orbits in 3 hours and Mike in $7\frac{1}{2}$ hours. At 12 noon Toronto time, Mike sees Pat directly below. At what time will this same situation occur again?

- (A) 4:00 p.m. (B) 7:30 p.m. (C) 3:30 p.m. (D) 5:00 p.m. (E) 8:00 p.m.

31. If $2 > x > 1$, then comparing $x - \frac{1}{x}$ and $x^2 - x$, it may be said that the first is:

- (A) equal to the second (B) greater than the second by more than 10 (C) less than the second by less than 3 (D) greater than the second by less than 10 (E) none of these.

32. The equation $x^3 + x - 27 = \frac{27}{x^2}$ has:

- (A) no real roots (B) 1 real root (C) 2 real roots (D) 3 real roots (E) 5 real roots