

Diagnostic Problems

MINNESOTA YOUTH MATH OUTREACH

Summer 2026

This diagnostic is designed to help place students into the appropriate group for camp activities. Students best suited for Group 1 (basics) should be comfortable solving at least the first 20 problems, which focus on fractions, basic algebra, proportional reasoning, and fraction questions. Students prepared for Group 2 (advanced) should be able to correctly solve at least 25 problems, including multi-step algebra, geometry, and basic number theory. Don't worry if you can't solve every problem; just do your best!

§1 Problems

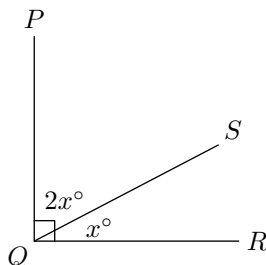
1. Compute $135 \times 206 + 65 \times 206$ in your head.
2. Euclid, Pythagoras, Ptolemy, and Hypatia are playing a game where they all have to think of a number, and then cube that number 20 times. Hypatia doesn't want to cube large numbers, so she chooses the number 1. Euclid thinks the same thing and also chooses the number 1. However, Pythagoras and Ptolemy don't think ahead and Pythagoras chooses 2 and Ptolemy chooses -2 . After they finish cubing their numbers (Pythagoras and Ptolemy take a while), all four players write their final numbers on a piece of paper. What is the sum of the numbers they wrote on the piece of paper?
3. Find $\frac{25}{4}$ divided by $\frac{1}{12}$.
4. Find $\frac{9}{10} + \frac{5}{6}$.
5. Solve for r :

$$\frac{r - 45}{2} = \frac{3 - 2r}{5}.$$

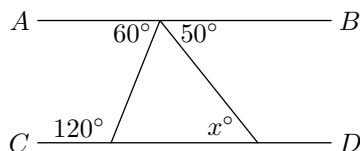
6. Jamie has a jar of coins containing the same number of nickels, dimes and quarters. The total value of the coins in the jar is \$13.20. How many nickels does Jamie have?
7. What is the smallest integer n such that $5n + 3 > -10$?
8. Write
$$10^0 - 10^{-1} + 10^{-2} - 10^{-3} + 10^{-4} - 10^{-5}$$
as a decimal.

9. The ratio of girls to boys in Ms. Snow's math class is 3:2. If there is a total of 45 students, how many girls are in Ms. Snow's math class?

10. After eating lunch together, Jay and Paul start walking in opposite directions. Jay walks 0.75 miles every 15 minutes and Paul power walks 2.5 miles every 30 minutes. In miles, how far apart are they after 1.5 hours?
11. What percent of x is equal to 40% of 50% of x ?
12. In the diagram, $\angle PQR = 90^\circ$. What is the value of x ?



13. In the diagram, AB and CD are straight lines. What is the value of x ?



14. The measures of the angles of a triangle are in a ratio of 3 : 5 : 7. What is the degree measure of the largest angle?
15. A rectangle has an area of 400 cm^2 . If the rectangle is a square, what is its perimeter?
16. Bill walks $\frac{1}{2}$ mile south, then $\frac{3}{4}$ mile east, and finally $\frac{1}{2}$ mile south. How many miles is he, in a direct line, from his starting point? Express your answer as a decimal to the nearest hundredth.
17. If $3m + 4n = 47$, and $m + n = 15$, what is m ?
18. What is the slope of a line parallel to the line $2x - 4y = 9$? Express your answer as a common fraction.
19. What is the largest possible value of x such that $x^2 - 5x - 36 = 0$?
20. If $h(x) = \sqrt{\frac{x+3}{2}}$, what is the value of $h(-1)$?
21. Isaac wrote the integers from 1 through 104, inclusive. How many digits did he write?
22. In a rectangular coordinate system, what is the number of units in the distance from the origin to the point $(-15, 8)$?
23. In a 10-kilometer race, each runner runs 5 km to point P and returns to the start by the same route. Ian runs 4 kilometers per hour faster than Sean. Ian runs to point P , turns around, and meets Sean 4 km from the start. Assume that Ian and Sean each maintain a constant speed and start at the same time. What is Sean's time, in minutes, for running the 10 kilometers?

24. Compute $\binom{7}{4}$.
25. In $\triangle ABC$, $AB = 12$ and $AC = 18$. Point E lies on BC and point D lies on AC such that $DE \parallel AB$. If $DE = 4$, what is the length of AD ?
26. Suppose that a is a multiple of 4 and b is a multiple of 8. Which of the following statements are true?
- A. $a + b$ must be even.
 - B. $a + b$ must be a multiple of 4.
 - C. $a + b$ must be a multiple of 8.
 - D. $a + b$ cannot be a multiple of 8.
27. In a certain isosceles right triangle, the altitude to the hypotenuse has length 6. What is the area of the triangle?
28. The symbol $5!$ means $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$. What is the greatest odd integer that is a factor of $5!$?
29. The diameter of a circle is increased so that the circumference increases by 70%. By what percent does the area increase?
30. Compute: $32^2 - 18^2$.

§2 Answers

- 1. 41200
- 2. 2
- 3. 75
- 4. $\frac{26}{15}$
- 5. $\frac{77}{3}$
- 6. 33
- 7. -2
- 8. 0.90909
- 9. 27
- 10. 12
- 11. 20%
- 12. 30°
- 13. 50°
- 14. 84°
- 15. 80

16. 1.25

17. 13

18. $\frac{1}{2}$

19. 9

20. 1

21. 204

22. 17

23. 75

24. 35

25. 12

26. A, B

27. 36

28. 15

29. 189%

30. 700