

Grade 8 Math Diagnostic Test

Free Printable Skill Check

Student Name			
Date			
Teacher/Parent			
40 Questions	60–75 Minutes	No Calculator	

Common Core-aligned skill check for US middle-school mathematics

Original assessment content. Not an official or endorsed Common Core assessment.

Instructions | Read before you begin

How to use this diagnostic

- Allow about 60–75 minutes.
- Do not use a calculator.
- Choose one answer for each multiple-choice question.
- Show your work for short-answer, graphing, and problem-solving questions.
- Complete all 40 questions. Each question is worth 1 point.

Quick Answer Record

1		2		3		4	
5		6		7		8	
9		10		11		12	
13		14		15		16	
17		18		19		20	
21		22		23		24	
25		26		27		28	
29		30		31		32	
33		34		35		36	
37		38		39		40	

Skills Assessed

Domain	Questions	Maximum Score
The Number System	1–4	4
Expressions and Equations	5–16	12
Functions	17–24	8
Geometry	25–34	10
Statistics and Probability	35–40	6

1

Which number is rational?

- A. $\sqrt{7}$
- B. π
- C. 0.272727...
- D. 0.101001000100001...

2

Which value is closest to $\sqrt{45}$, rounded to the nearest tenth?

- A. 6.4
- B. 6.5
- C. 6.7
- D. 7.1

3

Which statement is true?

- A. $\sqrt{30} < 5.4$
- B. $\sqrt{30} = 5.4$
- C. $\sqrt{30} > 5.4$
- D. $\sqrt{30}$ cannot be compared with 5.4

4

Order the numbers π , $\sqrt{10}$, and 3.2 from least to greatest. Show enough work to support your order.

Questions 5–8 | Exponents, roots, and scientific notation

5

Simplify $2^3 \times 2^{-5}$.

- A. $1/16$
- B. $1/4$
- C. 4
- D. 16

6

Solve $x^2 = 49$.

- A. $x = 7$
- B. $x = -7$
- C. $x = \pm 7$
- D. $x = 24.5$

7

Evaluate $\sqrt[3]{-216}$.

Answer: _____

8

Which quantity is greater?

7.2×10^{-6} or 3.5×10^{-5}

- A. 7.2×10^{-6}
- B. 3.5×10^{-5}
- C. They are equal.
- D. There is not enough information.

Questions 9–11 | Scientific notation, slope, and rate of change

9

Compute $(6 \times 10^5)(4 \times 10^{-3})$. Write your answer in scientific notation.

Answer: _____

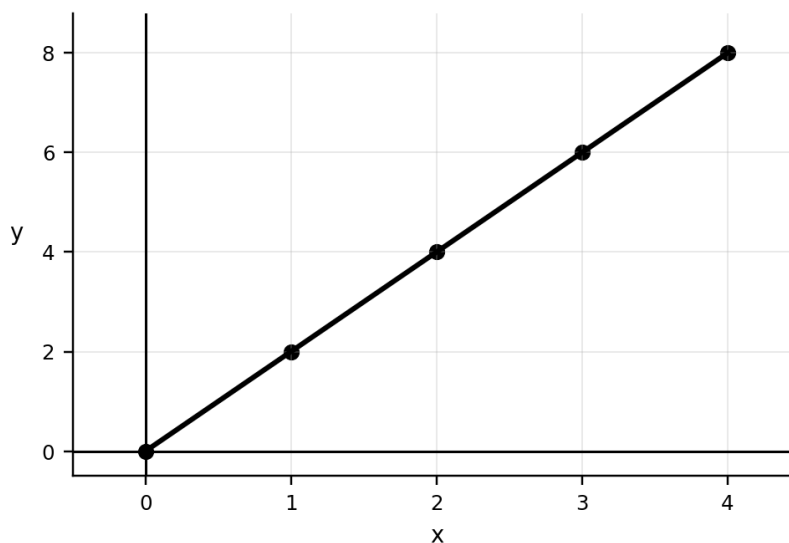
10

A calculator displays $8.31\text{E}-7$. Which expression is equivalent to this display?

- A. 8.31×10^7
- B. 8.31×10^{-7}
- C. 0.831×10^{-7}
- D. 83.1×10^{-7}

11

The graph shows a proportional relationship. What is the unit rate, or slope, of the line?



- A. $\frac{1}{2}$
- B. 2
- C. 4
- D. 8

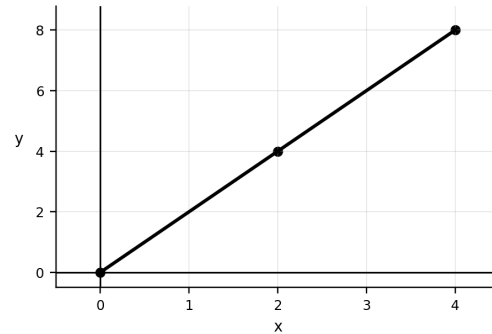
12

Function A is shown in the table. Function B is shown in the graph. Which function has the greater rate of change?

Function A

x	y
0	0
2	6
4	12

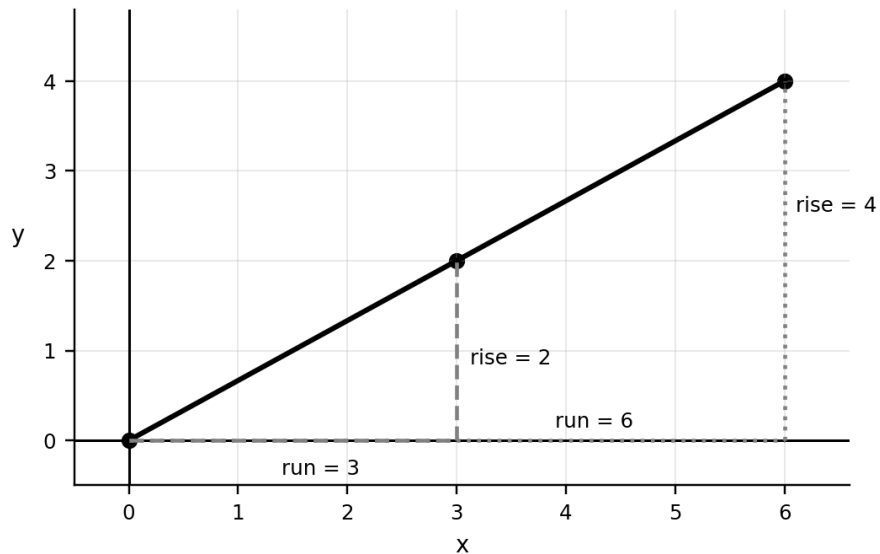
Function B



- A. Function A
- B. Function B
- C. They have the same rate of change.
- D. The rates cannot be compared.

13

The two right triangles drawn along the same line have rise/run ratios $\frac{2}{3}$ and $\frac{4}{6}$. Explain what this shows about the slope of the line.



14

Solve $4(2x - 3) = 5x + 9$. Show your steps.

15

Which equation has infinitely many solutions?

- A. $3(x + 4) = 3x + 12$
- B. $2x + 5 = 2x + 9$
- C. $4x - 3 = 2x + 5$
- D. $5x = 10$

16

Solve the system of equations: $y = 2x + 1$ and $y = -x + 7$.

- A. (2, 5)
- B. (5, 2)
- C. (3, 7)
- D. (1, 3)

17

Which relation is NOT a function?

- A. $\{(1, 3), (2, 5), (3, 7)\}$
- B. $\{(0, 2), (0, 5), (1, 8)\}$
- C. $\{(-1, 4), (0, 4), (1, 4)\}$
- D. $\{(2, 1), (4, 2), (6, 3)\}$

18

Compare Function A and Function B.

Function A

x	y
0	5
2	11
4	17

Function B

$$y = 2x + 9$$

a) Which function has the greater rate of change?

Answer: _____

b) Which function has the greater initial value?

Answer: _____

19

The table shows a relationship between x and y. Which description is correct?

x	0	1	2	3
y	1	4	9	16

- A. It is linear because y increases.
- B. It is linear because x increases by 1.
- C. It is nonlinear because the rate of change is not constant.
- D. It is nonlinear because all y-values are positive.

20

The table represents a linear function. Write an equation in the form $y = mx + b$.

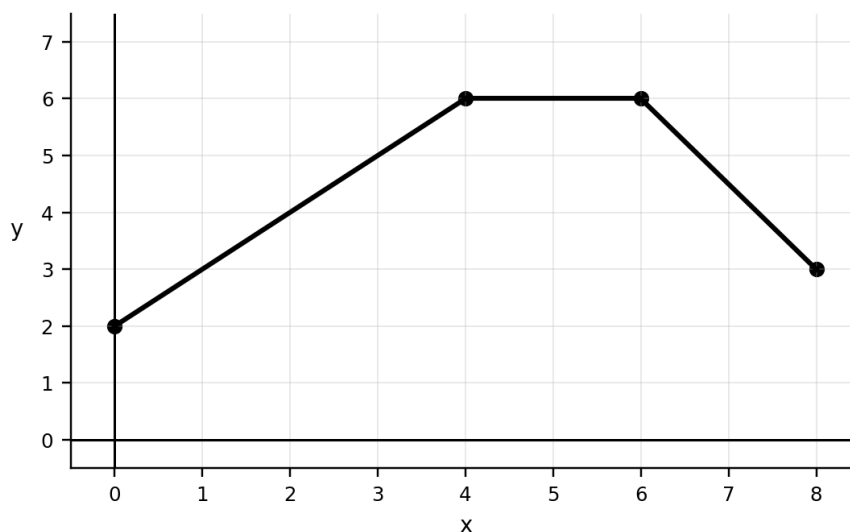
x	1	3	5	7
y	4	10	16	22

Equation: _____

Questions 21–22 | Function graphs and modeling

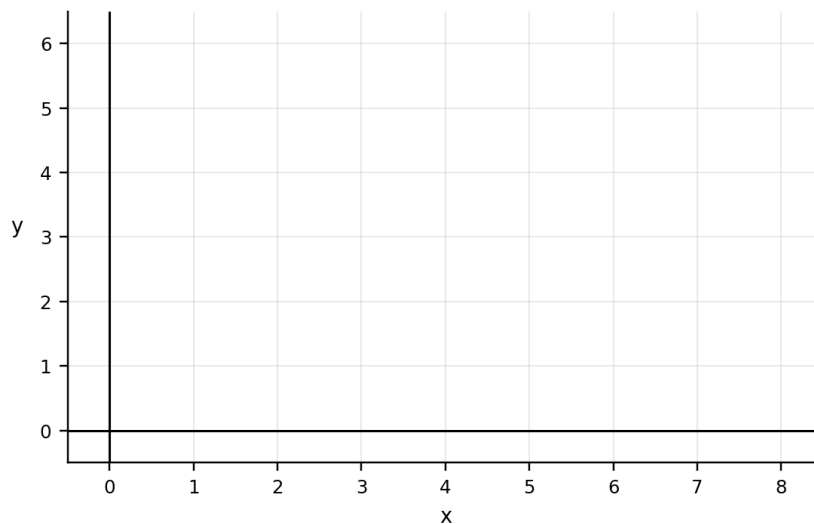
21

Describe how the function changes over each interval: $x = 0$ to 4, $x = 4$ to 6, and $x = 6$ to 8.



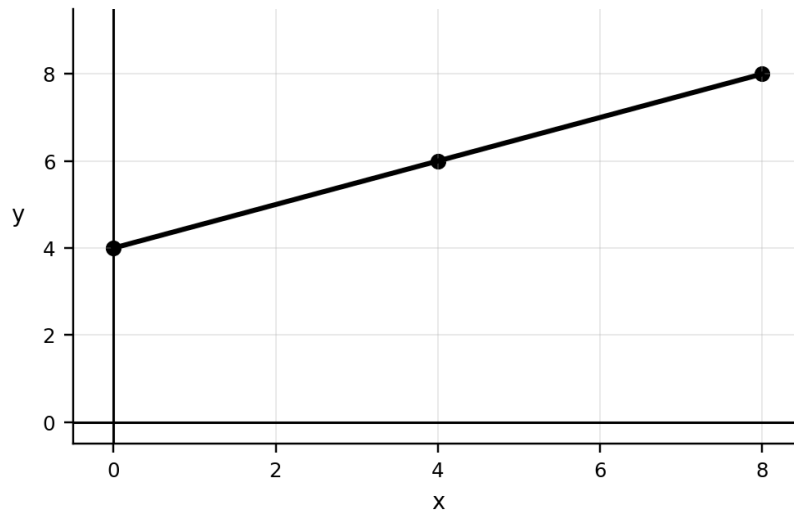
22

Sketch one graph that matches this description: The function starts at $(0, 1)$, increases steadily to $(3, 5)$, stays constant until $x = 5$, then decreases steadily to $(8, 2)$.



23

Function A is shown in the graph. Function B has an initial value of 1 and a constant rate of change of 2.



Function A

a) Which function has the greater rate of change?

Answer: _____

b) Which function has the greater initial value?

Answer: _____

24

A music service charges a one-time setup fee of \$15 plus \$7 for each month of service.

a) Write a function $C(m)$ for the total cost after m months.

Answer: _____

b) Explain what 15 and 7 represent in the context of the problem.

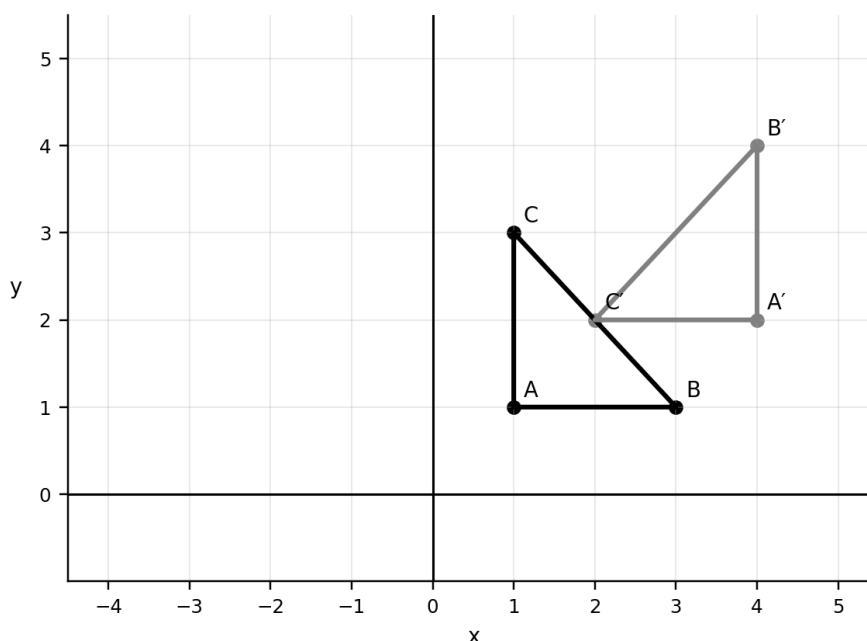
25

A figure is reflected across a line. Which property may change?

- A. Side lengths
- B. Angle measures
- C. Parallel relationships
- D. Clockwise/counterclockwise orientation

26

Triangle ABC is mapped to triangle A'B'C'. Which sequence of transformations produces the image shown?



- A. Rotate 90° counterclockwise about the origin, then translate 5 units right and 1 unit up.
- B. Rotate 90° clockwise about the origin, then translate 5 units right and 1 unit up.
- C. Reflect across the y-axis, then translate 5 units right and 1 unit up.
- D. Translate 3 units right and 1 unit up only.

27

A dilation centered at the origin maps the point $(2, -1)$ to $(6, -3)$. What is the scale factor?

Answer: _____

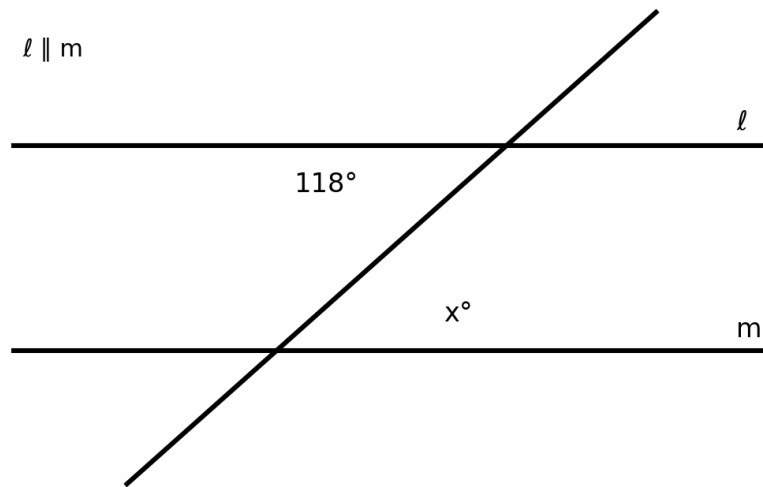
28

Triangle A has side lengths 4, 6, and 8. Triangle B has side lengths 6, 9, and 12. Which statement is correct?

- A. The triangles are congruent.
- B. Triangle B is a dilation of Triangle A with scale factor 1.5, so the triangles are similar.
- C. Triangle B is a dilation of Triangle A with scale factor 2.
- D. The triangles are not similar because their side lengths are different.

29

Lines ℓ and m are parallel. Find x .



- A. 62°
- B. 72°
- C. 118°
- D. 242°

30

A square with side length $a + b$ is partitioned into four congruent right triangles and a center square with side length c . The area equation is $(a + b)^2 = 4\left(\frac{1}{2}ab\right) + c^2$. Simplify this equation to obtain the Pythagorean Theorem, then state what the result means for a right triangle.

31

A right triangle has legs of length 9 units and 12 units. Find the length of the hypotenuse.

Answer: _____

32

A rectangular box measures 3 units by 4 units by 12 units. Find the distance from one corner of the box to the opposite corner. Show the two Pythagorean-Theorem steps.

33

Find the distance between the points $(-2, 3)$ and $(4, -5)$ on the coordinate plane.

34

Use the appropriate volume formulas. Leave each answer in terms of π .

a) Cylinder: radius 3 units, height 12 units

Answer: _____

b) Cone: radius 3 units, height 12 units

Answer: _____

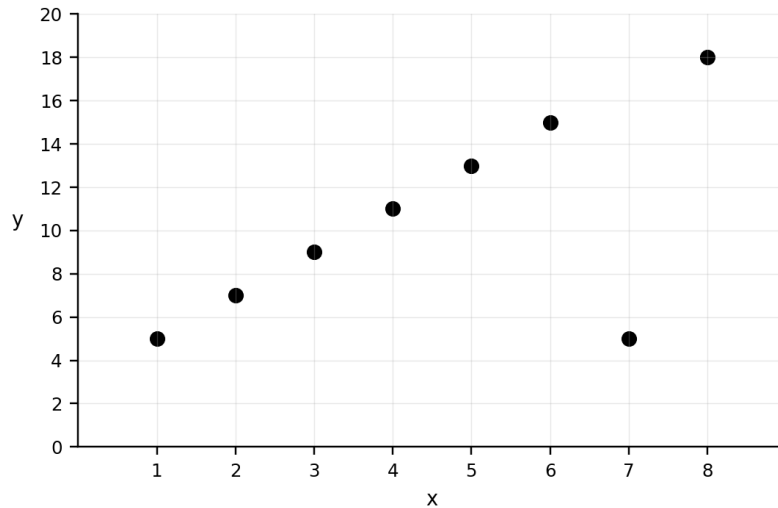
c) Sphere: radius 3 units

Answer: _____

Questions 35–36 | Scatter plots and association

35

The scatter plot shows data for two quantitative variables. Which description best fits the overall pattern?



Use this scatter plot for Questions 35–36.

- A. Strong negative linear association
- B. Positive association with one noticeable outlier
- C. No association
- D. Nonlinear association with no outliers

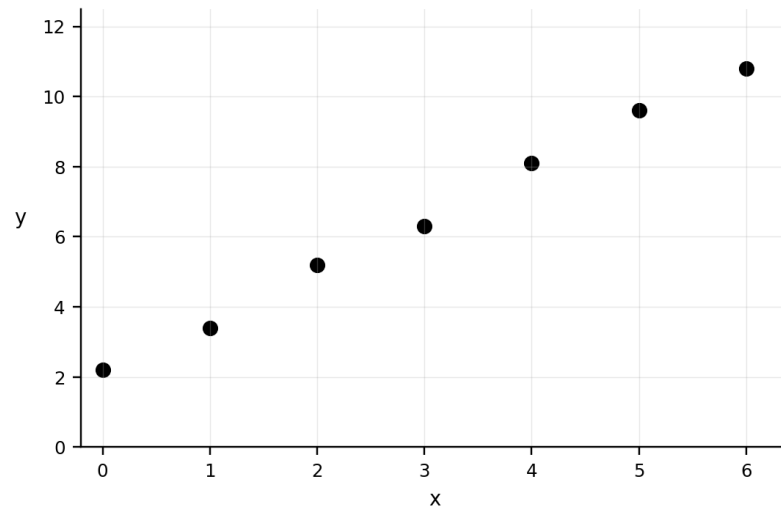
36

Which plotted point appears to be the outlier? Write its approximate coordinates.

Answer: _____

37

Which equation would be the most reasonable linear model for the scatter plot?



- A. $y = 1.5x + 2$
- B. $y = -1.5x + 2$
- C. $y = 0.2x + 10$
- D. $y = 4x - 2$

38

A line of best fit for plant height is $h = 1.5w + 12$, where w is the number of weeks and h is height in centimeters. Interpret both the slope and the intercept in context.

39

The table summarizes transportation to school and participation in an after-school sports program. Calculate the relative frequency of sports participation within each transportation group.

Transportation	Sports: Yes	Sports: No	Total
Bus	18	12	30
Walk/Bike	30	10	40
Total	48	22	70

Bus students participating in sports:

Answer: _____

Walk/Bike students participating in sports:

Answer: _____

40

Based on the relative frequencies in Question 39, does the table suggest an association between transportation mode and sports participation? Explain using the percentages. Do not claim that one variable causes the other.

Student Confidence Check

Skill Area	Confident	Some Practice	Need Help
The Number System	☐	☐	☐
Expressions and Equations	☐	☐	☐
Functions	☐	☐	☐
Geometry	☐	☐	☐
Statistics and Probability	☐	☐	☐

Score Tracker | Complete after checking the answer key

Record the score for each domain. Use the result to decide what to review next.

Domain	Questions	Score	Maximum	Review Priority
The Number System	1–4		4	High / Medium / Low
Expressions and Equations	5–16		12	High / Medium / Low
Functions	17–24		8	High / Medium / Low
Geometry	25–34		10	High / Medium / Low
Statistics and Probability	35–40		6	High / Medium / Low

Overall score guide

- 34–40: Strong readiness - begin Grade 8 practice papers and challenge work.
- 26–33: Generally on track - review the domains with the lowest scores.
- 18–25: Developing - complete targeted lessons before a full practice paper.
- 0–17: Foundation support recommended - revisit prerequisite skills step by step.

Diagnostic note: This test samples important Grade 8 skills. It is not a standardized test and should be considered alongside classroom work, teacher feedback, and student confidence.