Name: _____ Class: _____ Date: _____

GRADE 8 MATHEMATICS
MID-WINTER PACKET
EQUATIONS & EXPRESSIONS
FUNCTIONS

Directions:

- Read and answer the questions carefully
- Record your answers to this cover page
- Show All Your Work to receive full credit

QUESTIONS	ANSWERS
1	
2	
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25	
Score	**%**

Grade 8 Mathematics Reference Sheet

CONVERSIONS

1 yard = 3 feet
1 mile = 5,280 feet

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts

1 pound = 16 ounces
1 ton = 2,000 pounds

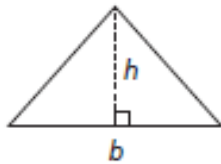## CONVERSIONS ACROSS MEASUREMENT SYSTEMS

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 1.609 kilometers
1 kilometer = 0.6214 mile

1 gallon = 3.785 liters
1 liter = 0.2642 gallon

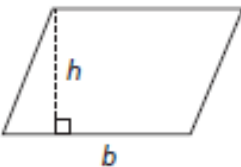1 pound = 0.454 kilogram
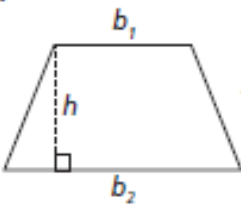1 kilogram = 2.2 pounds

FORMULAS AND FIGURES

Triangle

$A = \frac{1}{2}bh$

Parallelogram
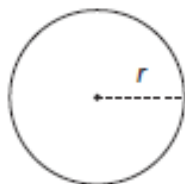
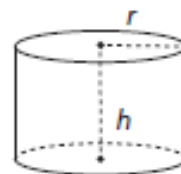$A = bh$

Trapezoid

$A = \frac{1}{2}h(b_1 + b_2)$

Circle
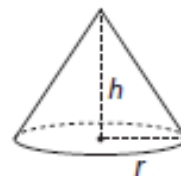
$C = 2\pi r$
$C = \pi d$
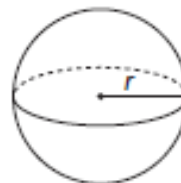$A = \pi r^2$

General Prism

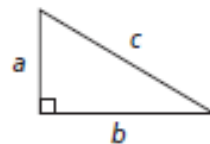$V = Bh$

Right Cylinder

$V = \pi r^2 h$

Right Cone

$V = \frac{1}{3}\pi r^2 h$

Sphere

$V = \frac{4}{3}\pi r^3$

Pythagorean Theorem

$c^2 = a^2 + b^2$

TIPS FOR TAKING THE TEST

Here are some suggestions to help you do your best:

- Read each question carefully and think about the answer before choosing your response.
- You have been provided with mathematics tools (a ruler and a protractor) and a reference sheet to use during the test. It is up to you to decide when each tool and the reference sheet will be helpful. You should use mathematics tools and the reference sheet whenever you think they will help you to answer the question.

1 What is the value of n in the equation shown below?

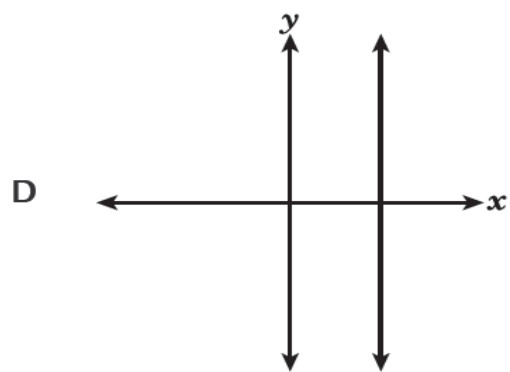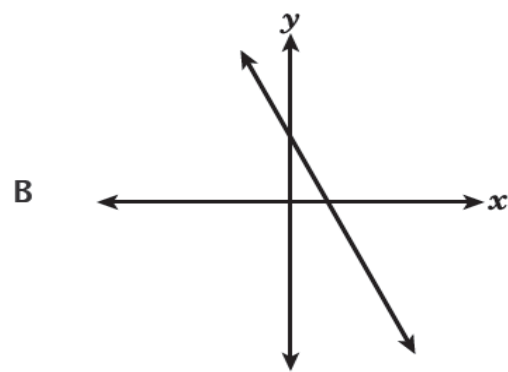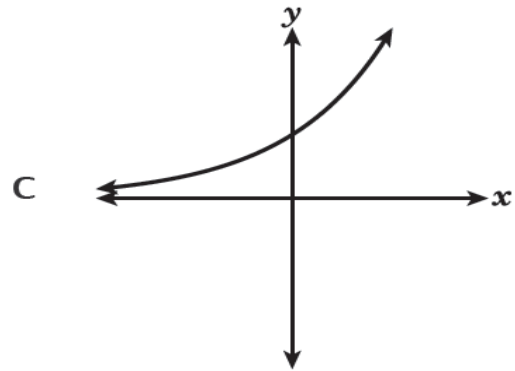$$2^2 \times 2^n = (2^4)^3$$

A 5

B 6

C 10

D 12

2 Which expression is equivalent to $2^2 \cdot \dfrac{2}{2^4}$?

A 2^{-2}

B 2^{-1}

C 2^6

D 2^7

3 Which graph represents a linear function of *x* ?

A

C

B

D
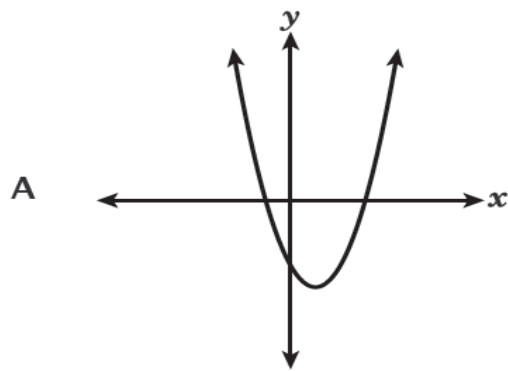
4 At a factory, the cost of making different numbers of toothbrushes is shown in the table below.

COST OF TOOTHBRUSHES

Number of Toothbrushes	3	6	9	12
Cost (dollars)	$4.50	$9.00	$13.50	$18.00

A linear function models the cost based on the number of toothbrushes made. Which statement about the rate of change of this function is true?

A   The cost increases by $1.50 for each additional toothbrush made.

B   The cost increases by $4.50 for each additional toothbrush made.

C   The cost increases by $9.00 for each additional 3 toothbrushes made.

D   The cost increases by $18.00 for each additional 3 toothbrushes made.

5 Which equation represents a function of x that is **not** linear?

A $y = 4(x + 3)$

B $y = 4^2 + 3x$

C $y = 4x + 3x^2$

D $y = \dfrac{4 + x}{3}$

6 Mr. Thomsen is buying two types of gift cards to give as prizes to employees at a company meeting. He will buy restaurant gift cards that each cost $50. He will also buy movie theater gift cards that each cost $20. He has $450 to buy a total of 15 gift cards. How many of each type of gift card can Mr. Thomsen buy?

A He can buy 5 restaurant gift cards and 10 movie theater gift cards.

B He can buy 8 restaurant gift cards and 7 movie theater gift cards.

C He can buy 10 restaurant gift cards and 5 movie theater gift cards.

D He can buy 12 restaurant gift cards and 3 movie theater gift cards.

7 The relationship between temperature in degrees Fahrenheit and degrees Celsius is shown in the graph below.

TEMPERATURE CONVERSION
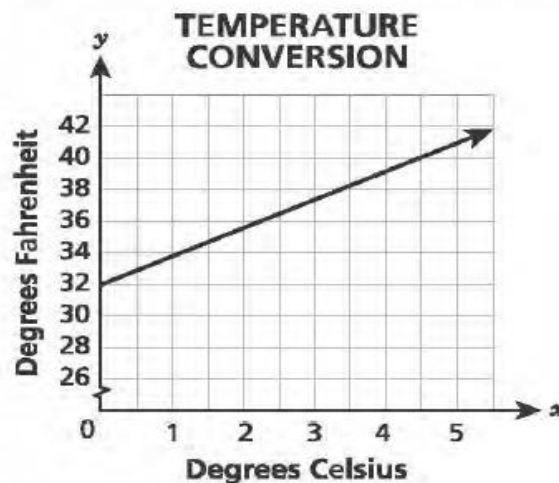
What is the meaning of the y-intercept?

A the change in degrees Fahrenheit for every change of one degree Celsius

B the change in degrees Celsius for every change of one degree Fahrenheit

C the temperature in degrees Fahrenheit when the temperature is zero degrees Celsius

D the temperature in degrees Celsius when the temperature is zero degrees Fahrenheit

8 Chris and Sam earn money shoveling snow, as described below.

- The amount of money Chris earns can be modeled by the equation $y = 8.25x$, where y is the total amount of money, in dollars, earned in x hours.

- The table below shows the relationship between the total amount of money earned, y, in dollars, and the total amount of time worked, x, in hours, for Sam.

SAM'S EARNINGS

x	4	6	8
y	30	45	60

Which statement correctly compares the rates at which Chris and Sam earn money shoveling snow?

A Sam earns $0.75 more per hour than Chris.

B Chris earns $0.75 more per hour than Sam.

C Sam earns $0.25 more per hour than Chris.

D Chris earns $0.25 more per hour than Sam.

9 Which equation represents the line shown on the coordinate plane below?
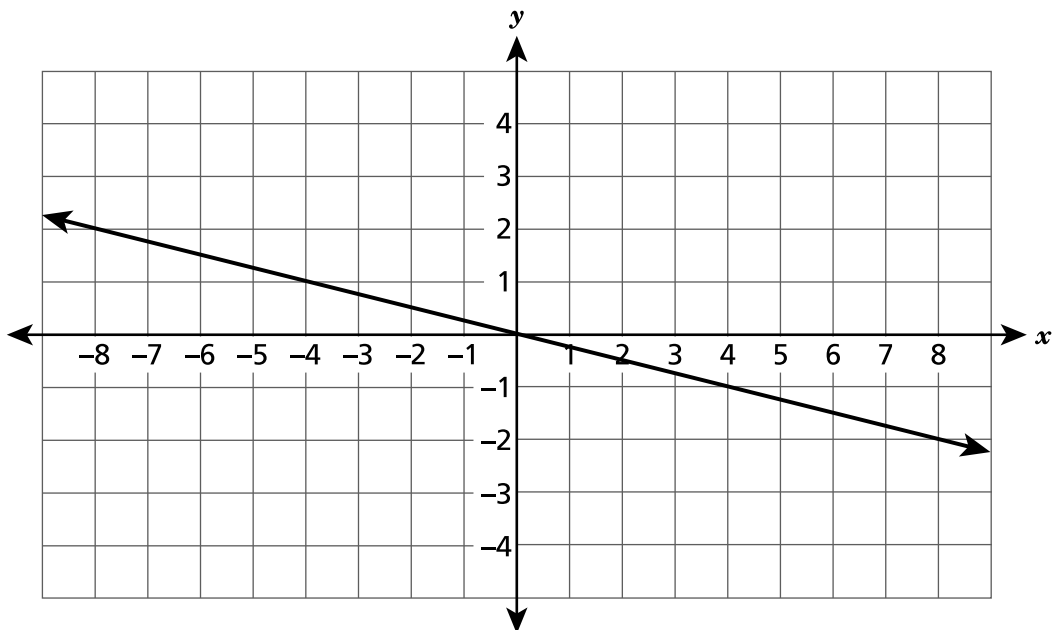
A $y = 4x$

C $y = \dfrac{1}{4}x$

B $y = -4x$

D $y = -\dfrac{1}{4}x$

10

Which table of values represents a linear function?

A

x	y
0	0
1	1
4	16
9	81

C

x	y
0	0
1	2
4	8
9	18

B

x	y
0	1
1	3
4	9
9	20

D

x	y
0	0
1	2
4	4
9	6

11

Simplify.

$$5^{-8} \times 5^4$$

A $\dfrac{1}{5^4}$

B $\dfrac{1}{5^{32}}$

C -5^2

D -5^{12}

12

What is the value of t that satisfies the equation below?
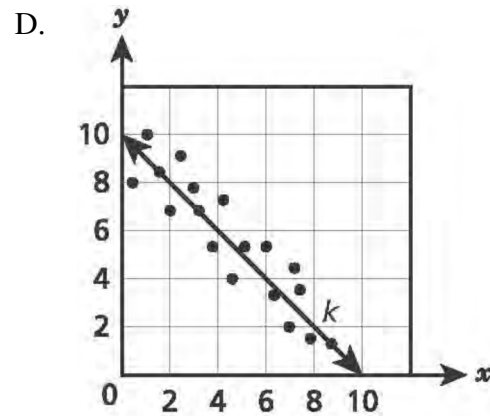
$$3(t + 4) - 2(2t + 3) = -4$$

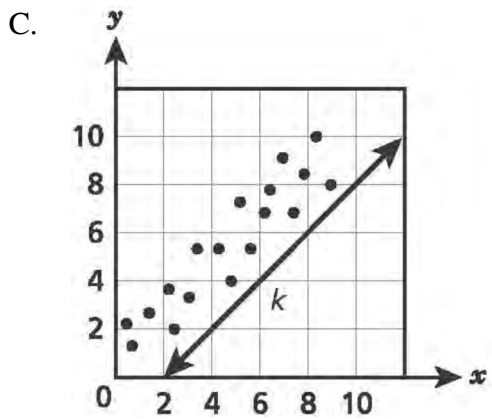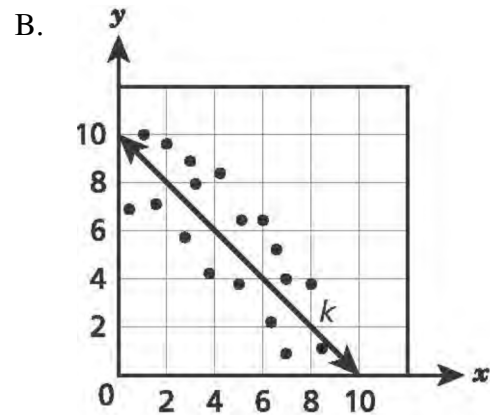A $-\dfrac{11}{3}$

B $-\dfrac{4}{5}$

C 10

D 11

13

Line k is the line of best fit for a set of data on a scatter plot. The data show a strong linear association. Which scatter plot *best* represents these data and line k.

A.

B.

C.

D.
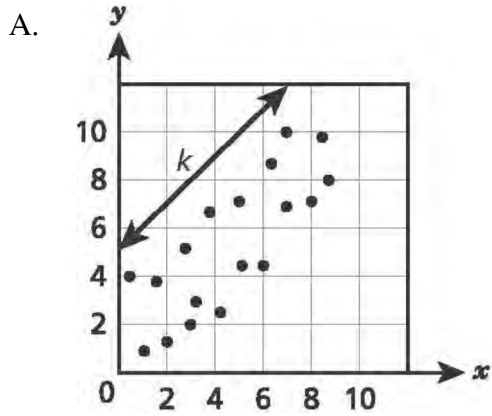
14 Function 1 is represented by the equation $y = -\frac{4}{5}x - 2$, and function 2 is represented by the graph below.
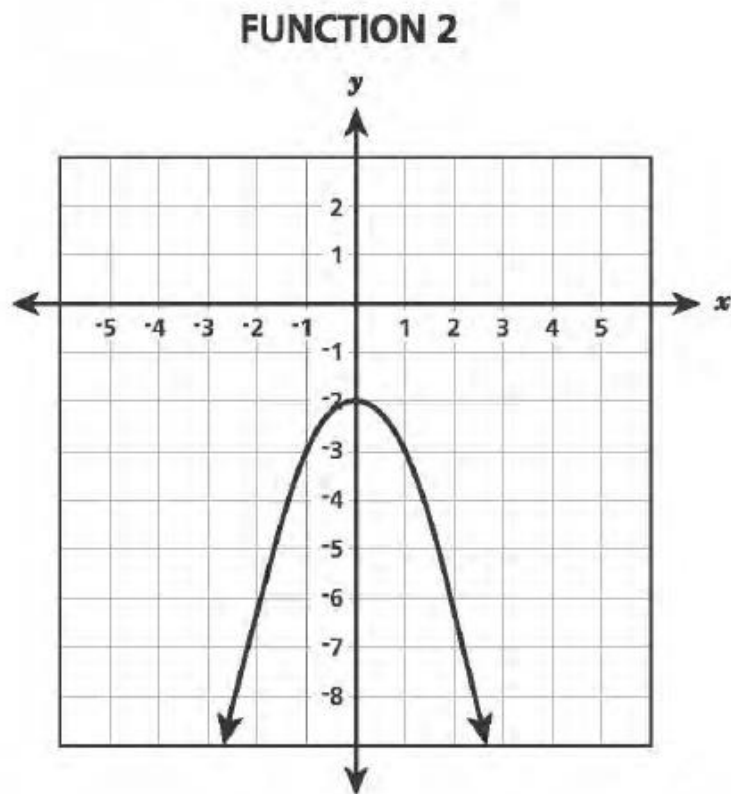
FUNCTION 2

For which of the functions are all the output values less than −1?

A both functions

B only function 1

C only function 2

D neither function

15 Linear function K passes through points $(-3, 7)$ and $(3, 3)$. What is the rate of change of function K?

A $-\dfrac{3}{2}$

B $-\dfrac{2}{3}$

C $\dfrac{3}{2}$

D $\dfrac{2}{3}$

16   Which table represents a relation that is **not** a function?

A

Input	Output
1	1
2	1
3	1
4	1

C

Input	Output
-1	-7
-2	11
-3	13
-4	105

B

Input	Output
2	0
4	1
6	2
8	0

D

Input	Output
3	0
5	2
7	1
3	-4

17   Which equation represents a nonlinear function?

A $y = -3x + 1$

B $y = x^2 + 1$

C $y = \dfrac{x}{2} + 1$

D $y = 2x + \dfrac{1}{2}$

18 On a coordinate plane, the graph of a line passes through the origin and the point $(10, 14)$. What is the equation of the line?

A $\quad y = \dfrac{5}{7}x$

B $\quad y = \dfrac{7}{5}x$

C $\quad y = x + \dfrac{5}{7}$

D $\quad y = x + \dfrac{7}{5}$

19 A crane is lowering a concrete block from a height of 270 feet above the ground at a constant rate of 2.5 feet per second. Which function can be used to determine h, the height, in feet, above the ground of the concrete block after s seconds?

A $\ h = 270s + 2.5$

B $\ h = 2.5s + 270$

C $\ h = 270 - 2.5s$

D $\ h = 2.5s - 270$

20 Function P is a linear function with a y-intercept of 5. Function Q is defined by the equation $y = -\dfrac{1}{3}x + 4$. Which statement **must** be true about functions P and Q?

A Both functions have the same slope.

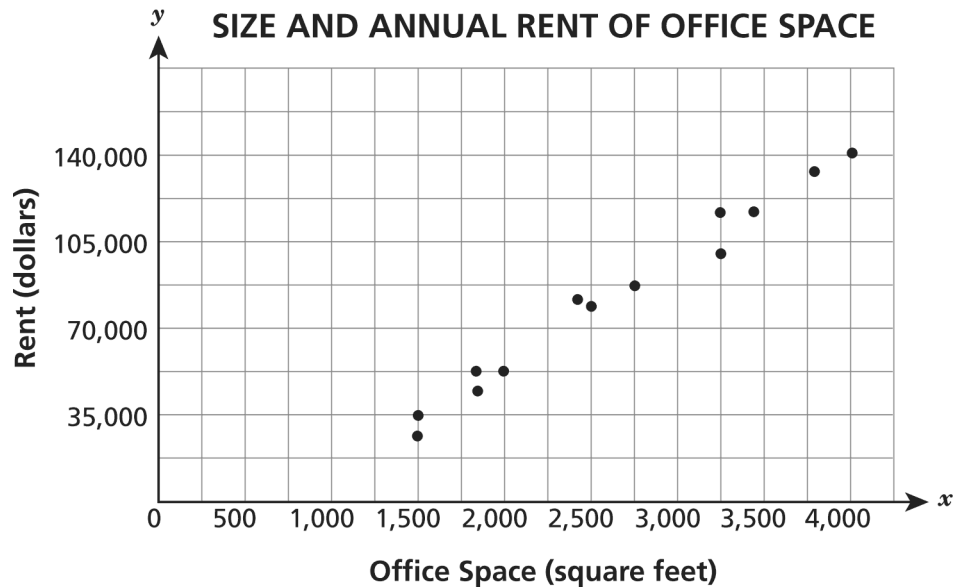B Both functions have a negative slope.

C The functions will have the same input when $y = 0$.

D The functions will have different outputs when $x = 0$.

21 The scatter plot shows the sizes and annual rents of some office spaces in the downtown area of a city.

SIZE AND ANNUAL RENT OF OFFICE SPACE


What would the line of best fit reveal about these data?

A. There is a strong negative relationship between the cost of rent and the size of the office space.

B. There is a strong positive relationship between the cost of rent and the size of the office space.

C. There is a weak positive relationship between the cost of rent and the size of the office space.

D. There is a weak negative relationship between the cost of rent and the size of the office space.

22 Which equation does **not** represent a linear function?

A $y = 2(x - 3)$

B $y = 2^2 - 3x$

C $y = \dfrac{x + 1}{5}$

D $y = 2x^2 + 3x$

23

The graph of a function is shown below.
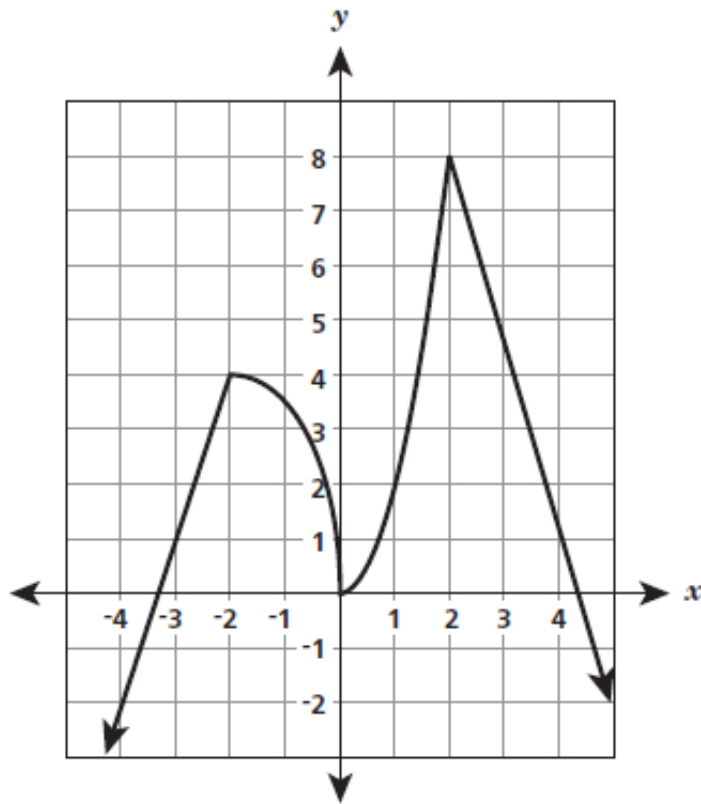
For which interval of x is the function decreasing and nonlinear?

A   between -4 and -2

B   between -2 and 0

C   between 0 and 2

D   between 2 and 4

24

The cost to rent a paddleboat at the city park includes an initial fee of $7.00, plus $3.50 per hour. Which equation models the relationship between the total cost, y, and the number of hours, x, that the paddleboat is rented?

A $y = 3.5x + 7$

B $y = 7x + 3.5$

C $y = \frac{x}{7} + 3.5$

D $y = \frac{x}{3.5} + 7$

25 A line contains the points (4, 2) and (0, −1). What is the equation of the line?

A $y = 2x - 6$

B $y = \frac{3}{4}x - 1$

C $y = \frac{1}{4}x + 1$

D $y = \frac{4}{3}x - \frac{10}{3}$