

CCSS High School Math Samples

- 1) Simplify:  $\frac{4^{\frac{3}{2}}}{16^{-\frac{1}{4}}}$
- A. -16    B. -2    C. 2    D. 16

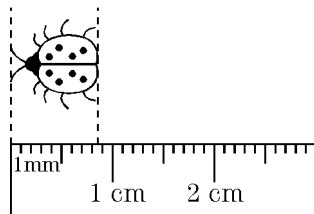
- 2) Write in simplest form:

$$\left(\frac{ax^2}{b^3}\right)^3 \left(\frac{b}{a^2x}\right)^2$$

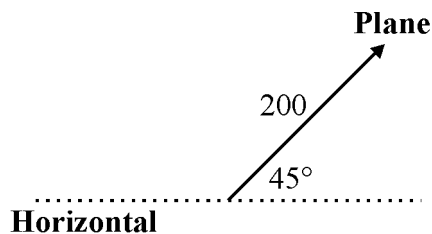
- 3) Express as a power of 2:  $\frac{4^9 \times 8^5}{(4 \times 8)^{9-5}}$

- 4) Desmond is measuring a ladybug using a ruler marked in centimeters and millimeters. Which measurement shows the appropriate level of precision?

- A. 8 mm  
 B. 8.5 mm  
 C. 8.52 mm  
 D. 8.520 mm



- 5) The diagram below represents an airplane ascending at a speed of 200 miles per hour at an angle of  $45^\circ$  above the horizontal. What is the plane's rate of ascent rounded to the nearest tenth of a mile per hour?



- A. 140.0    B. 141.4    C. 144.2    D. 145.6

- 6) The following matrix represents the food inventory of a catering company.

	<b>Frozen</b>	<b>Fresh</b>
Steaks	120	10
Fish	225	25
Chickens	300	60

How many fresh chickens does the company have in stock?

- A. 5    B. 35    C. 60    D. 360

- 7) What is the degree of the following expression?

$$3a^3 + 7a^2 - 9a + 5$$

- A. 1    B. 3    C. 4    D. 5

- 8) For doing a certain job, you are offered 1¢ the first day, 3¢ the second day, 9¢ the third day and so on. In dollars and cents, how much will you earn in total for the first 15 days?

- A. \$45,624.49    B. \$47,829.69  
 C. \$70,158.56    D. \$71,744.53

- 9) Find the nonintegral rational root of  $5x^3 - 8x^2 - 2x + 3 = 0$ .

- A.  $-\frac{3}{5}$     B.  $\frac{1}{3}$     C.  $\frac{3}{5}$     D.  $\frac{2}{3}$

- 10) Find the sum of the six coefficients in the expansion of  $(p + r)^5$ ?

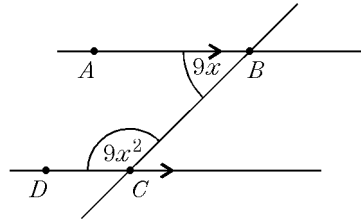
11) Simplify:  $\frac{2x^2 - 2}{2x^2 - 3x + 1} \div \frac{x^2 + 7x + 12}{x^2 + x - 6} \times \frac{4x^2 - 1}{2x^2 - 3x - 2}$

- A. 1  
 B.  $\frac{1}{x + 4}$   
 C.  $\frac{2x + 2}{x + 3}$   
 D.  $\frac{2x + 2}{x + 4}$

12) Simplify:  $\frac{4}{6 - x - x^2} + \frac{3}{x^2 + 6x + 9}$

13) How many ounces of a 10% argyrol solution must be added to 8 ounces of a 25% solution of argyrol in order that the resulting solution will be 12% argyrol?

14) In the diagram, line  $AB$  is parallel to line  $CD$ . If the measure of  $m\angle ABC = (9x)^\circ$  and the measure of  $m\angle DCB = (9x^2)^\circ$ , then what is the measure of  $\angle ABC$ ?



15) If  $a$ ,  $b$ , and  $c$  are real numbers,  $a < b$  and  $c > 0$ , then which of the following statements is true?

- A.  $\frac{c}{b} < \frac{c}{a}$   
 B.  $a + c < b - c$   
 C.  $ca > \frac{b}{c}$   
 D.  $\frac{c}{a} < \frac{b}{c}$

16) Solve the equation  $R = \frac{ST}{S + T}$  for  $S$ .

17) Use the table below to list the steps and explain how to solve the equation  $6x^3 - 7x^2 - 20x = 0$  over the set of real numbers. (You may not need to use all lines in the table.)

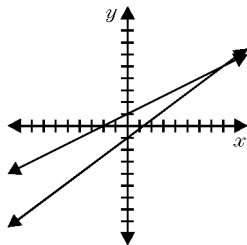
Step	Reason
1) $6x^3 - 7x^2 - 20x = 0$	1)
2)	2)
3)	3)
4)	4)
5)	5)
6)	6)

- 18) Given the graphs of  $y = \frac{3}{4}x - 1$  and  $y = \frac{1}{2}x + 1$ , determine which ordered pair is a solution to:

$$y \geq \frac{3}{4}x - 1$$

$$y \geq \frac{1}{2}x + 1$$

- A.  $(-2, -1)$   
 B.  $(13, 2)$   
 C.  $(4, 4)$   
 D.  $(13, 8)$



- 19) Solve for  $x$ :

$$\frac{x^2 + 3x - 18}{x - 2} \cdot \frac{x + 2}{x - 3} = -3$$

- A.  $\{-3\}$     B.  $\{0\}$     C.  $\{3\}$     D.  $\{4\}$

- 20) What is an expression for the  $n$ th term in this sequence?

Position of term	1st	2nd	3rd	4th	$n$ th
Value of term	1	3	9	27	

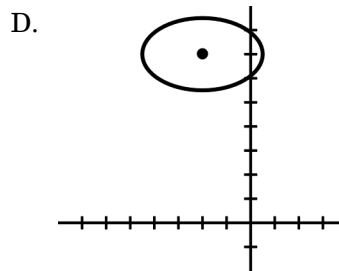
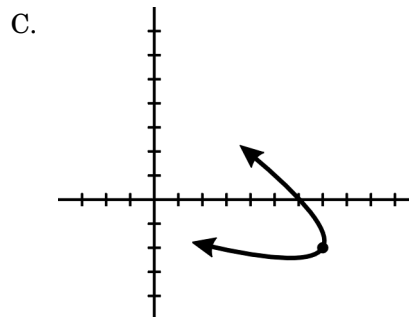
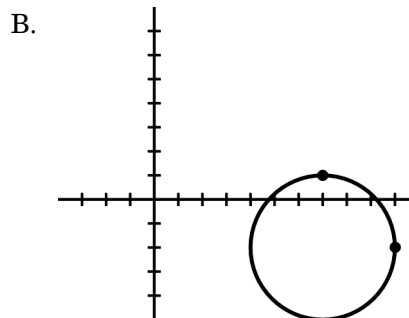
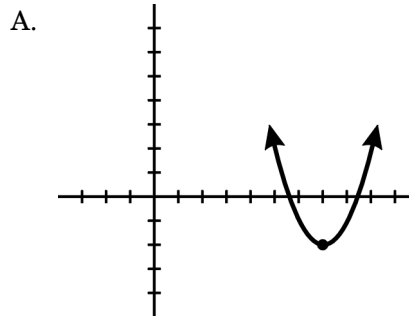
- A.  $2^n + 1$                       B.  $2^n + (-1)^n$   
 C.  $3^{n-1}$                          D.  $4^n - 1$

- 21) The arithmetic mean between two numbers is 3 and their positive geometric mean is  $2\sqrt{2}$ . Find the smaller of the two numbers.

- 22) What is the average rate of change for  $f(z) = -2z^2 - 12z - 19$  over the interval  $[-4, -2]$ ?

- A.  $-3$     B.  $-\frac{2}{3}$     C.  $1$     D.  $0$

- 23) Which graph has lines of symmetry of  $x = 7$  and  $y = -2$ ?



24) What does the quadratic function  $f(x) = x^2 - 10x + 9$  look like when it is rewritten in the form  $f(x) = a(x - p)^2 + q$ ?

- A.  $f(x) = (x - 5)^2 + 16$
- B.  $f(x) = (x - 5)^2 - 16$
- C.  $f(x) = (x + 5)^2 - 16$
- D.  $f(x) = (x - 5)^2 + 9$

25) The key light intensity in Daphne's studio is modeled by the formula

$$I = 3d + \frac{15}{2^d}$$

where  $I$  is the intensity measured on a light meter at the front of the studio and  $d$  is the subject's distance (in feet) from the backdrop. The meter readings for various distances are shown in the table below.

meter reading	intensity (estimated)
first	10.5
second	10.9
third	12.9
fourth	18.2
fifth	21.1

Choose the reading that corresponds to a subject being 6 feet from the backdrop.

26) Determine which quadratic function has a larger minimum.

$$f(x) = x^2 + 2x - 3$$

$x$	-2	-1	0	1	2
$g(x)$	-5	-6	-5	-2	3

- A.  $f(x)$ ; minimum = -3
- B.  $g(x)$ ; minimum = -6
- C.  $g(x)$ ; minimum = -2
- D.  $f(x)$ ; minimum = -4

27) Order the following expressions from fastest growing to slowest as  $x$  increases without bound.

$$(1.7)^x$$

$$x^2$$

$$\sqrt{x}$$

$$\ln x$$

$$e^x - 1$$

28) What is the 8th term of this arithmetic sequence?

$$a - b, \frac{a - b}{2}, 0, \dots$$

- A.  $-\frac{5a}{2} + \frac{5b}{2}$
- B.  $-3a + 3b$
- C.  $-7a^2 + 7b^2$
- D.  $\frac{b - a}{24}$

29) Evaluate:  $\sum_{k=3}^{\infty} 12\left(-\frac{2}{3}\right)^{k-1}$

- A.  $\frac{36}{5}$
- B.  $\frac{16}{5}$
- C. 36
- D. 48

30) If  $f(x) = x^3$  is transformed into the graph of  $h(x) = (x - 3)^3 - 2$ , which of the following describes the transformation?

- A. Translation of 3 units to the right and 2 units down
- B. Translation of 3 units to the left and 2 units down
- C. Translation of 2 units to the right and 3 units down
- D. Translation of 2 units to the left and 3 units down

- 31) Davon measured the weight of dust (in grams) collected in an air cleaner every day, as shown in the table below. How much dust should he expect to collect on the fourth day? Drag the correct number into the table.

256

216

194

168

96

Dust Collection Data

Days	1	2	3	4
Weight (g)	8	24	72	

- 32) The pH of a solution measures how alkaline or acidic it is. It is defined as

$$\text{pH} = -\log_{10}(\text{Hydrogen Ion Concentration})$$

where the Hydrogen Ion Concentration is in moles per liter.

- a) What is the pH of an acid rain if its hydrogen ion concentration is  $3.0 \times 10^{-5}$ ?
- b) What is the hydrogen ion concentration of a lake if its pH = 4.7?

- 33) What is the period of the function  $f(x) = 2 \sin \frac{1}{2}x$ ?

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

- 34) Solve:  $\cos x = -0.4566$ , where  $0 \leq x < 2\pi$  (accurate to 2 decimal places)

A. 2.04, 4.24      B. 2.67, 5.81  
C. 4.24, 5.19      D. 2.04, 5.81

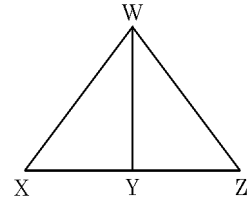
- 35) If  $\tan 2\theta = \frac{24}{7}$  and  $2\theta$  is in quadrant I, then what are the values of  $\sin \theta$  and  $\cot \theta$ ?

$\sin \theta =$  \_\_\_\_\_       $\cot \theta =$  \_\_\_\_\_

- 36) What is the image of  $(-4, 1)$  after a rotation of  $180^\circ$  clockwise?

A.  $(1, 4)$       B.  $(4, -1)$   
C.  $(4, 1)$       D.  $(1, -4)$

- 37) Given:  $\overline{WY}$  is the angle bisector of  $\angle XWZ$   
 $m\angle XYW =$  \_\_\_\_\_  
 $m\angle ZYW =$  \_\_\_\_\_



Prove:  $\triangle WXY \cong \triangle WZY$

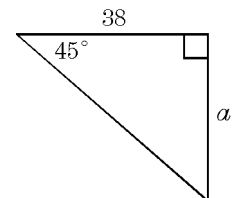
statement	reason
$\overline{WY}$ is the $\angle$ bisector of $\angle XWZ$	(1)
$m\angle XYW = m\angle ZYW$	(2)
$m\angle XWY = m\angle ZWY$	(3)
$WY = WY$	(4)
$\triangle WXY \cong \triangle WZY$	(5)

In the above proof, what is reason (4)?

- A. sides opposite equal  $\angle$ s are equal  
B. definition of a right angle  
C. definition of an altitude  
D. reflexive property

- 38) Find  $a$ .

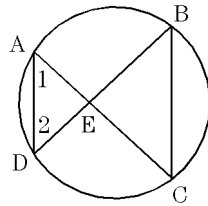
A. 19      B. 26.9  
C. 38      D. 53.7



- 39) In right triangle  $\triangle ABC$ ,  $BC = 10$ ,  $m\angle B = 90^\circ$  and  $m\angle A = 20^\circ$ . What is the measure of  $\overline{AB}$  to 1 decimal place?

40) Given:  $m\angle 1 = m\angle 2$

Prove:  $DB = AC$



Statements	Reasons

41) The sides of a triangle are 579, 914 and 1,247. Find the largest angle of the triangle to the nearest ten minutes.

42) An ellipse has foci  $(1, -3)$  and  $(3, -3)$ , and the sum of its focal radii is 6. What is the equation of the ellipse?

A.  $\frac{(x + 2)^2}{9} + \frac{(y - 3)^2}{6} = 1$

B.  $\frac{(x - 2)^2}{9} - \frac{(y + 3)^2}{6} = 1$

C.  $\frac{(x - 2)^2}{9} + \frac{(y + 3)^2}{8} = 1$

D.  $\frac{(x - 2)^2}{9} - \frac{(y + 3)^2}{8} = 1$

43) Slicing a cone \_\_\_\_\_ gives a cross section of an ellipse.

- A. parallel to its side
- B. parallel to its base
- C. perpendicular to its base
- D. none of these

44) In 2010, the Centers for Disease Control and Prevention conducted a K–12 school germ study. They found that the dirtiest area was students' desktops with 13 million bacteria. Given that the average school desk is 16 in by 24 in, what is the bacterial density? Round to 4 significant digits.

- A.  $3.385 \times 10^4$  bacteria per inch<sup>2</sup>
- B.  $2.257 \times 10^4$  bacteria per inch<sup>2</sup>
- C.  $5.078 \times 10^6$  bacteria per inch<sup>2</sup>
- D.  $1.333 \times 10^6$  bacteria per inch<sup>2</sup>

45) A small graphic design firm, David's Designs, claims that the size of its projects are comparable to that of a larger firm, Goliath Ideas. David's Designs cites the fact that the average project bill for both companies is \$5500 to support their claim. Further analysis shows that the average project bill is in the 90th percentile for David's Design and the 70th percentile for Goliath Ideas.

- a) How can the same average project bill be in different percentiles?
- b) Do you agree with David's Designs claim? Why?

- 46) In the frequency distribution table, engine displacement (in cubic centimeters) for 25 cars is shown. What is the mean for the data?

Displacement (cm <sup>3</sup> )	Frequency
1000–2000	8
2000–3000	10
3000–4000	5
4000–5000	2

- A. 2000    B. 2500    C. 2540    D. 2200

- 47) Edna owns seven lots in a small development community. An outbreak of lawn-eating insects called chinch bugs forces her to spread insecticide granules. Deciding to conduct an experiment, Edna spreads different amounts of insecticide on each lot, and records the results after 2 weeks in the table as shown.

Amount of insecticide (in pounds)	Damage inflicted by chinch bugs (in sq ft)
8	1350
20	1100
60	375
42	700
35	850
70	200
47	650

What is the correlation coefficient for the linear regression that best models this data?

- A. 0.9971                      B. 0.9992  
 C. -0.9971                      D. -0.9992

- 48) Ninety percent of Canadian parents believe that students should pass Math 12 or its equivalent before they graduate. We take a random sample of 40 parents.

- a) Is it likely or unlikely that a sample proportion of 0.81 will agree?  
 b) Is it likely or unlikely that 38 will agree?

- 49) A loaded die has the following probabilities associated with each outcome.

Outcome	1	2	3	4	5	6
Probability	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

When a single die is tossed, what is the probability that the outcome is even or divisible by 3?

- A.  $\frac{7}{12}$                       B.  $\frac{5}{6}$                       C.  $\frac{2}{3}$                       D.  $\frac{5}{12}$

- 50) If  $U$  is the universal set, then under what conditions, on the two sets  $A$  and  $B$ , will  $A \cap B = B$ ?

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CCSS High School Math Samples 12/29/2023

1.	Answer: D	12.	Answer: $\frac{-x - 18}{(x + 3)^2(x - 2)}$
	Objective: N.RN.2		Objective: A.APR.7
	Points: 1		Points: 1
2.	Answer: $\frac{x^4}{ab^7}$	13.	Answer: 52 ounces
	Objective: N.RN.2		Objective: A.CED.1
	Points: 1		Points: 1
3.	Answer: $2^{13}$	14.	Answer: $36^\circ$
	Objective: N.RN.2		Objective: A.CED.1
	Points: 1		Points: 1
4.	Answer: B	15.	Answer: A
	Objective: N.Q.3		Objective: A.CED.3
	Points: 1		Points: 1
5.	Answer: B	16.	Answer: $\frac{RT}{T-R}$
	Objective: N.VM.3		Objective: A.CED.4
	Points: 1		Points: 1
6.	Answer: C	17.	Answer: [answers vary]; $x = 0, \frac{5}{2}, -\frac{4}{3}$
	Objective: N.VM.6		Objective: A.REI.1
	Points: 1		Points: 1
7.	Answer: B	18.	Answer: C
	Objective: A.SSE.1A		Objective: A.REI.12
	Points: 1		Points: 1
8.	Answer: D	19.	Answer: B
	Objective: A.SSE.4		Objective: A.REI.2
	Points: 1		Points: 1
9.	Answer: C	20.	Answer: C
	Objective: A.APR.3		Objective: F.IF.3
	Points: 1		Points: 1
10.	Answer: 32	21.	Answer: 2
	Objective: A.APR.5		Objective: F.IF.3
	Points: 1		Points: 1
11.	Answer: D	22.	Answer: D
	Objective: A.APR.7		Objective: F.IF.6
	Points: 1		Points: 1



23.  
Answer: B  
Objective: F.IF.4  
Points: 1
24.  
Answer: B  
Objective: F.IF.8A  
Points: 1
25.  
Answer: 0,0,0,1,0  
Objective: F.IF.8B  
Points: 1
26.  
Answer: D  
Objective: F.IF.9  
Points: 1
27.  
Answer: 5,1,2,3,4  
Objective: F.IF.9  
Points: 1
28.  
Answer: A  
Objective: F.BF.2  
Points: 1
29.  
Answer: B  
Objective: F.BF.2  
Points: 1
30.  
Answer: A  
Objective: F.BF.3  
Points: 1
31.  
Answer: [B]  
Objective: F.LE.1C  
Points: 1
32.  
Answer:  $4.5, 2.00 \times 10^{-5}$   
Objective: F.LE.4  
Points: 1
33.  
Answer: D  
Objective: F.TF.4  
Points: 1
34.  
Answer: A  
Objective: F.TF.7  
Points: 1
35.  
Answer:  $\frac{3}{5}, \frac{4}{3}$   
Objective: F.TF.7  
Points: 1
36.  
Answer: B  
Objective: G.CO.2  
Points: 1
37.  
Answer: D  
Objective: G.CO.10  
Points: 1
38.  
Answer: C  
Objective: G.SRT.8  
Points: 1
39.  
Answer: 27.5  
Objective: G.SRT.8  
Points: 1
40.  
Answer: [proof]  
Objective: G.C.1  
Points: 1
41.  
Answer:  $111^\circ 20'$   
Objective: G.SRT.11  
Points: 1
42.  
Answer: C  
Objective: G.GPE.3  
Points: 1
43.  
Answer: D  
Objective: G.GMD.4  
Points: 1
44.  
Answer: A  
Objective: G.MG.2  
Points: 1
45.  
Answer: Answers may vary  
Objective: S.ID.3  
Points: 1
46.  
Answer: C  
Objective: S.ID.5  
Points: 1
47.  
Answer: D  
Objective: S.ID.8  
Points: 1

48.  
Answer: U; L  
Objective: S.IC.2  
Points: 1

49.  
Answer: C  
Objective: S.CP.7  
Points: 1

50.  
Answer:  
Objective: S.CP.8  
Points: 1