NumWorks ACT© Practice Problems

1. Nineteen numbered balls are placed into a container and mixed around. One ball is randomly drawn from the container. What is the probability of drawing a ball with a number less than 7 written on it?

A. $\frac{1}{7}$

B. $\frac{1}{19}$

C. $\frac{12}{19}$

D. $\frac{13}{19}$

E. $\frac{6}{19}$

2. Which of the following expressions is equivalent to $-5x^4 - 6x^4 + 3x^3$?

F. x^{11}

G. $-8x^{11}$

H. $-x^4 + 3x^3$

J. $-11x^4 + 3x^3$

K. $-11x^8 + 3x^3$

3. When $x = 4$, $8 + 4(24 \div (2x)) =$?

A. 11

B. 20

C. 28

D. 48

E. 200

4. $|9 - 3| - |2 - 6| =$?

F. -10

G. -2

H. 2

J. 10

K. 20

5. The expression $(5a - 4b)(4a + b)$ is equivalent to:

A. $20a^2 - 21ab - 4b^2$

B. $20a^2 - 21ab + 4b^2$

C. $20a^2 - 11ab - 4b^2$

D. $20a^2 - 11ab + 4b^2$

E. $20a^2 - 4b^2$

6. Of the 120 customers at an ice cream shop, $\frac{1}{3}$ of the customers ordered chocolate, $\frac{1}{4}$ of the customers ordered vanilla and the rest of the customers ordered strawberry. How many of the customers ordered strawberry?

F. 50

G. 60

H. 70

J. 80

K. 90

7. The number of frogs, *f*, in Anna's pond at the beginning of each year can be modeled by the equation $f(x) = 4\left(2^x\right)$, where x represents the number of years after the beginning of the year 2000. For example, $x = 0$ represents the beginning of the year 2000, $x = 1$ represents the beginning of the year 2001, and so forth. According to the model, how many frogs were in Anna's pond at the beginning of the year 2005?

A. 64

B. 128

C. 256

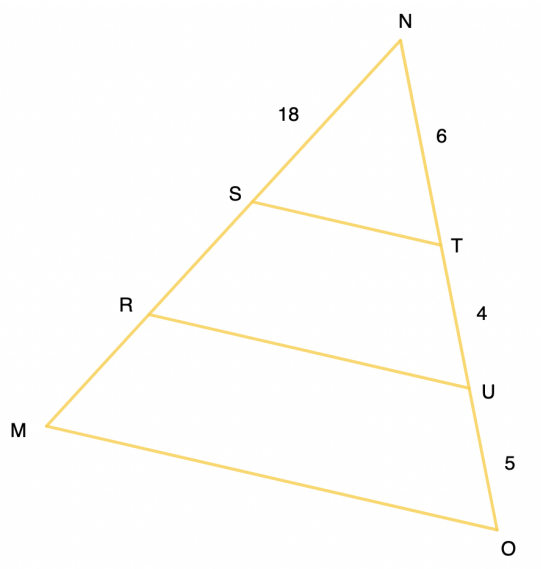
D. 2048

E. 65,536

8. Andrew drove from Raleigh to Charlotte. At 11:00 a.m., he was 150 mi from Charlotte. At 1:00 p.m., he was 25 mi from Charlotte. Which of the following values is closest to Andrew's average speed, in miles per hour, from 11:00 a.m. to 1:00 p.m. ?

F. 13
G. 26
H. 63
J. 75
K. 125

9. In the figure shown below, R and S lie on $\overline{MN}$, T and U lie on $\overline{NO}$, $\overline{ST}$ and $\overline{RU}$ are parallel to $\overline{MO}$, and the given lengths are in feet. What is the length of $\overline{MN}$, in feet?



A. 9
B. 18
C. 27
D. 45
E. 50

10. Mohammed bikes 24 miles in 2 hours. What is the average number of *minutes* it takes him to bike 1 mile?

F. 5
G. 12
H. 22
J. 26
K. 60

11. A bag contains 6 red chips, 11 yellow chips, and 9 green chips. How many additional yellow chips must be added to the 26 chips already in the bag so that the probability of randomly drawing a yellow chip is $\frac{4}{5}$?

A. 49
B. 55
C. 74
D. 80
E. 85

12. In the standard (x, y) coordinate plane, the point $(4, 3)$ is the midpoint of $\overline{CD}$. Point C has coordinates $(7, 4)$. What are the coordinates of point D ?

F. $\left(\frac{3}{2}, \frac{1}{2}\right)$
G. $(1, 2)$
H. $(10, 5)$
J. $(1, 3)$
K. $(-2, 1)$

13. A manufacturing company pays Sophia $12 for each of the first 25 devices she builds in one week. If Sophia builds more than 25 devices in a week, she gets a bonus for each additional device which is 1.5 times as much as the regular pay. Sophia builds 33 devices in 1 week and gets $89 in deductions taken out of her pay for the week. After the deductions are taken out, how much of Sophia's pay for this week remains?

A. $211
B. $307
C. $325
D. $355
E. $444

14. At Nick's Candy Market, the price of a box of candy depends on the total number of boxes purchased at 1 time, as shown in the table below. In 2 trips to Nick's Candy Market, Kirstin purchased 4 boxes of candy on Tuesday and 2 boxes of candy on Thursday. How much money would Kirstin have saved if she had instead purchased 6 boxes of candy in 1 trip on Tuesday?

Number of boxes	Price per box
1-2	$1.50
3-4	$1.25
5-6	$1.00
7 or more	$0.75

F. $0.25
G. $0.50
H. $1.50
J. $2.00
K. $3.00

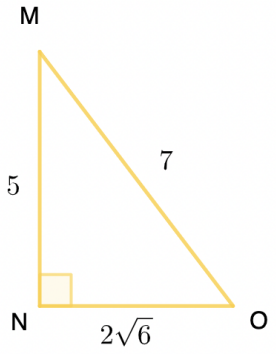
15. What is 4% of 5.23×10^4 ?

A. 1,307.5
B. 2,092
C. 13,075
D. 20,920
E. 209,200

16. What value of x satisfies the equation $-3(2-5x) = 4(3x-2)$?

F. $\frac{2}{27}$
G. $\frac{27}{4}$
H. 1
J. $-\frac{14}{27}$
K. $-\frac{2}{3}$

17. In the right triangle ΔMNO shown below, the given lengths are in centimeters. What is $\cos M$?



A. $\frac{2\sqrt{6}}{7}$
B. $\frac{2\sqrt{6}}{5}$
C. $\frac{5\sqrt{6}}{4}$
D. $\frac{5}{7}$
E. $\frac{7}{5}$

18. $\left(\frac{8}{27}\right)^{-\frac{2}{3}} = ?$

F. $-\frac{4}{9}$

G. $-\frac{16}{81}$

H. $\frac{16}{81}$

J. $\frac{9}{4}$

K. $\frac{81}{16}$

19. Simon starts at his front door and walks 6 yards south, 8 yards west, 9 yards south, and 7 yards west to the mailbox. About how many yards less would he walk if he could walk directly from the front door to the mailbox?

A. 9

B. 15

C. 21

D. 25

E. 30

20. The standard score, z, corresponding to the raw score, x, for a given set of data is given by $z = \frac{x-\mu}{\sigma}$, where μ is the mean of the set and σ is the standard deviation. If, for a set of scores, $\mu = 124$ and $\sigma = 16$, which of the following is the raw score, x, corresponding to $z = 2$?

F. 156

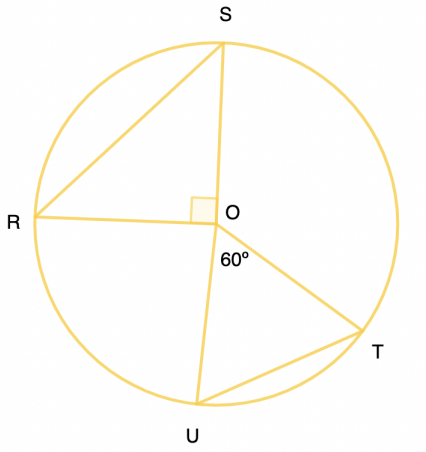
G. 140

H. 126

J. 122

K. 92

21. In the figure below, R, S, T, and U lie on the circle centered at O.



Which of the following does NOT appear in the figure?

A. Acute triangle

B. Equilateral triangle

C. Isosceles triangle

D. Right triangle

E. Scalene triangle

22. $\overline{AB}$ is parallel to the line $x + 4y = 7$. What is the slope of $\overline{AB}$?

F. -4

G. $-\frac{1}{4}$

H. $\frac{1}{4}$

J. $\frac{7}{4}$

K. 7

23. Given $y = \frac{-x}{x-2}$ and $x > 2$, which of the following is a possible value of y ?

A. 1.9

B. 0.9

C. 0.0

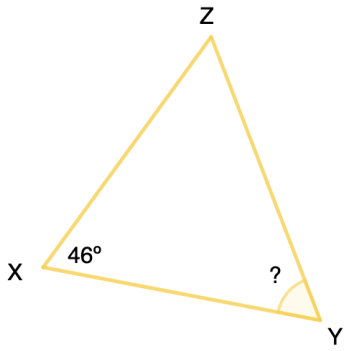
D. -0.9

E. -1.9

24. The set of all positive integers that are divisible by both 12 and 28 is infinite. What is the least positive integer in this set?

F. 4
G. 72
H. 84
J. 168
K. 336

25. In ΔXYZ shown below, the measure of $\angle X$ is 46°, and $\overline{XY} \cong \overline{XZ}$. What is the measure of $\angle Z$?



A. 44°
B. 46°
C. 54°
D. 67°
E. 74°

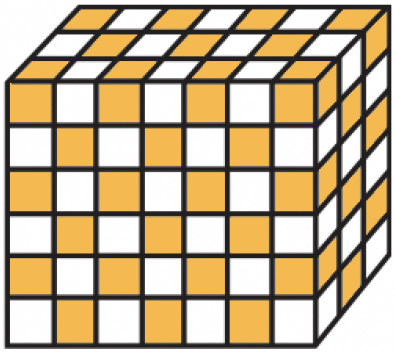
26. A mat has regions shaded in one of two colors, red or green. About 1.23×10^7 square centimeters of the mat are shaded red while the other 4.51×10^7 square centimeters is shaded green. If a ball is thrown and lands on a random point on the mat, which of the following is the best estimate of the probability that the ball will land in a green shaded area?

F. 85%
G. 79%
H. 45%
J. 27%
K. 21%

27. Nina completed her last 4 daily jogs in 18, 22, 22 and 24 minutes. The mean, median, and mode of her times were 21.5, 22, and 22, respectively. On the 5th day, Nina's jog lasted 23 minutes. How does the mean, median, and mode of all 5 jog times compare to the mean, median, and mode of her first 4 jog times?

	Mean	Median	Mode
A.	equal	greater	greater
B.	greater	greater	greater
C.	greater	greater	equal
D.	greater	equal	greater
E.	greater	equal	equal

28. Below is a solid rectangular prism made up of alternating congruent white and yellow cubes such that two cubes of the same color have at most 1 edge touching. What is the total number of yellow cubes that were used to build the prism?



F. 33
G. 60
H. 63
J. 84
K. 126

29. One side of a square has a length of 15 yards. A certain rectangle whose area is equal to the area of the square has a width of 9 yards. What is the length, in yards, of the rectangle?

A. 15
B. 21
C. 24
D. 25
E. 30

30. The average of Paul's 4 test scores is 93.0. Martin had the same test scores on the first three tests but scored an 86 on the fourth test, on which Paul scored an 80. What is the average of Martin's test scores?

F. 90.0
G. 93.0
H. 94.5
J. 96.5
K. 98.0

31. The vector **j** represents 1 mile per hour south, and the vector **k** represents 1 mile per hour west. Marie is biking east at 8 miles per hour. Which one of the following vectors represents Marie's velocity, in miles per hour?

A. $8\mathbf{j}$
B. $8\mathbf{k}$
C. $-8\mathbf{j}$
D. $-8\mathbf{k}$
E. $8\mathbf{j} + 8\mathbf{k}$

32. Three identical glasses are shown below. One glass is empty, and the other 2 glasses are $\frac{1}{5}$ full and $\frac{4}{7}$ full of water, respectively. If the water were redistributed equally among the 3 glasses, what fractional part of each glass would be filled?

F. $\frac{1}{4}$
G. $\frac{2}{3}$
H. $\frac{5}{24}$
J. $\frac{9}{35}$
K. $\frac{27}{70}$

33. Juan is purchasing tiles to renovate the floor in his primary bathroom that is 6 feet wide by $5\frac{1}{4}$ feet long. Each tile is a square 9 inches wide by 9 inches long. What is the minimum number of tiles that Juan must purchase to cover this area of his bathroom floor?

A. 3
B. 7
C. 32
D. 56
E. 160

34. In the standard (x, y) coordinate plane, a circle with its center at $(5, 3)$ and a radius of 4 has which of the following equations?

F. $(x - 5)^2 + (y - 3)^2 = 4$
G. $(x - 5)^2 + (y - 3)^2 = 16$
H. $(x + 5)^2 + (y + 3)^2 = 4$
J. $(x + 5)^2 + (y + 3)^2 = 16$
K. $(x + 3)^2 + (y + 5)^2 = 16$

Use the following information to answer questions 35 - 38.

Often seen in large dogs, hip dysplasia is a common skeletal condition caused by a genetic predisposition. The nW test can determine with 100% accuracy whether a dog carries the gene associated with hip dysplasia. That is, if an nW test is negative, the dog does NOT carry the gene. If an nW test is positive, the dog does carry the gene.

Eunice has designed a new test called the Eun to determine if a dog has hip dysplasia that is less expensive than the nW test. In some cases, it will produce inaccurate results. To determine the accuracy of the Eun test, both tests were administered to 100 dogs whose human companions volunteered them for the test. The results from this administration are summarized below.

	Positive nW test	Negative nW test
Positive Eun test	10	20
Negative Eun test	5	65

35. It costs $125 to administer each nW test and $15 to administer each Eun test. What was the total cost to administer both tests to all volunteer dogs?

A. $3,000
B. $3,150
C. $3,245
D. $12,500
E. $14,000

36. What percent of volunteer dogs actually carry the hip dysplasia gene?

F. 5%
G. 15%
H. 25%
J. 30%
K. 35%

37. For how many volunteer dogs did the Eun test give an incorrect result?

A. 5
B. 20
C. 25
D. 85
E. 70

38. One of the volunteer dogs whose Eun test result was positive will be chosen at random. To the nearest 0.001, what is the probability the chosen volunteer dog does NOT possess the hip dysplasia gene?

F. 0.250
G. 0.308
H. 0.333
J. 0.667
K. 0.850

39. Given matrices $A = [-1 \quad 0]$ and $B = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$ which of the following matrices is AB?

A. $[-4]$
B. $[-3]$
C. $[-2]$
D. $[2]$
E. $[3]$

40. Consider the following shapes. Which will never have a horizontal line of symmetry, regardless of how it is oriented?

F. Line segment
G. Square
H. Pentagon
J. Parallelogram
K. Scalene triangle

41. The equation $12x^2 - 7x = 10$ has 2 solutions. What is the greater of the 2 solutions?

A. $\frac{2}{3}$
B. $\frac{4}{5}$
C. $\frac{5}{4}$
D. $\frac{3}{2}$
E. $\frac{7}{12}$

42. Which of the following is equal to $(\cos 60°)(\cos 30°) + (\sin 60°)(\sin 30°)$?

F. $\cos(60° - 30°)$
G. $\cos(60° + 30°)$
H. $\sin(60° - 30°)$
J. $\sin(60° + 30°)$
K. $\cos\left(\frac{60°+30°}{2}\right)$

43. What is the circumference of a circle that has an area of 64π square units?

A. 8π
B. 16π
C. 32π
D. 64π
E. 1024π

44. Sally made 3 cups of a salad dressing that is 60% olive oil and 40% balsamic vinegar. She tried it and realized that the vinegar taste was too strong. In order to make the dressing taste better, she will need to add just oil into the dressing so that the new dressing will now be 70% oil and 30% balsamic vinegar. How many cups of oil will Sally need to create this new dressing?

F. 0.3
G. 0.5
H. 1
J. 1.5
K. 2

45. For all $x \neq \pm y$, $\frac{x+y}{x} + \frac{x-y}{y} =$?

A. $\frac{1}{x+y}$
B. $\frac{2x}{xy}$
C. $\frac{x^2+y^2}{x^2-y^2}$
D. $2x$
E. $\frac{x^2+y^2}{xy}$

46. Xavier, Lauren, and Amy sold tickets for their class show. Amy sold three times as many tickets as Xavier did and Lauren sold five times as many as Amy did. What fraction of these tickets did Xavier sell?

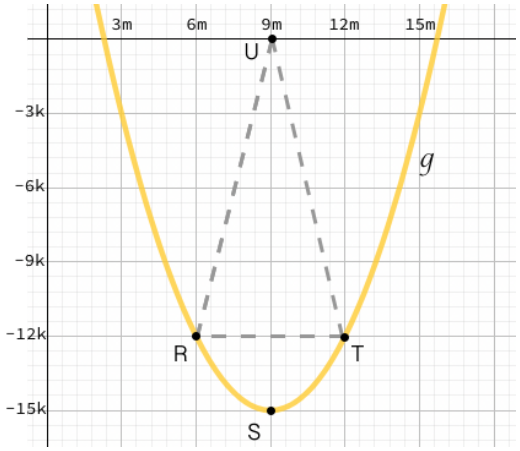
F. $\frac{1}{19}$
G. $\frac{1}{16}$
H. $\frac{1}{15}$
J. $\frac{1}{8}$
K. $\frac{1}{3}$

47. In the Olympics, eight different people compete in the final round of the 100m track and field event. Three of those people will win the Gold, Silver, and Bronze medals. How many different possible outcomes of people will there be for those medals?
(Note: The positions of the non-medal participants do not matter.)

A. 3
B. 8
C. 21
D. 336
E. 512

Use the following information to answer questions 48 - 50.

The quadratic function g and ΔRTU are graphed in the standard (x, y) coordinate plane below. Points $R(6m, -12k)$, $S(9m, -15k)$, and $T(12m, -12k)$ are on g. Point $U(9m, 0)$ is NOT on g.



48. In terms of m and k, what is the area, in square coordinate units, of ΔRTU?

F. $27mk$
G. $36mk$
H. $54mk$
J. $72mk$
K. $108mk$

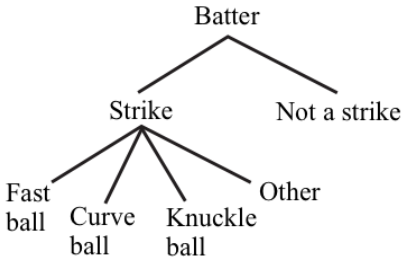
49. Point R will remain fixed, and point U will move to the right along the x-axis. As U continues to move to the right, which of the following statements describes what will happen to the slope of $\overline{RU}$?

A. It will decrease and eventually be negative.
B. It will decrease but never be negative.
C. It will stay the same.
D. It will increase but never be positive.
E. It will increase and eventually be positive.

50. One of the following values is equal to $g(15m)$. Which one?

F. $-3m$
G. $-3k$
H. $3k$
J. $15m$
K. $15k$

51. A baseball coach, Bill, wanted to determine which type of pitch led to the most strikes for his star pitcher, Rory. The diagram below illustrates whether the batter got a strike or not and if there was a strike, which type of pitch it was from. Rory pitches on average 40% strikes. Of those who do get a strike, approximately $\frac{2}{7}$ are from his fast balls, $\frac{1}{7}$ are from his knuckle balls, $\frac{1}{7}$ are from his other types of pitches, and the rest are from his curve balls. In a game, if Rory had 18 strikes from curve balls, how many pitches would he have made?



A. 20
B. 72
C. 105
D. 158
E. 315

52. What is the 250th digit after the decimal point in the repeating decimal $0.\overline{2739}$?

F. 0
G. 2
H. 3
J. 7
K. 9

53. Given that $f(x) = x + 2$ and $g(x) = x^2 - 1$, what are all the values of x for which $g(f(x)) = 0$?

A. -3 and -1
B. $-2, -1$, and 1
C. -1 and 1
D. 1 and 3
E. $-\sqrt{1}$ and $\sqrt{1}$

54. Assume that a is a positive number, b is a negative number, and $|a| > |b|$, which of the following expressions has the greatest value?

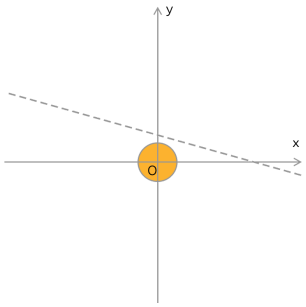
F. $\left|\frac{a-b}{a}\right|$
G. $\left|\frac{a-b}{b}\right|$
H. $\left|\frac{a+b}{a-b}\right|$
J. $\left|\frac{a+b}{a}\right|$
K. $\left|\frac{a+b}{b}\right|$

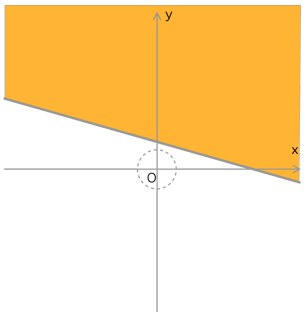
55. If $i = \sqrt{-1}$, then $\frac{i+i^2+i^3}{i^5+i^6+i^7} =$?

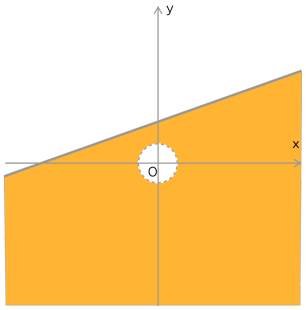
A. -3
B. -1
C. $\frac{1}{2}$
D. 1
E. 3

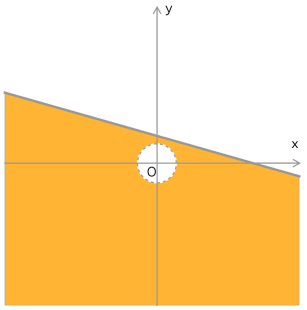
56. In one of the following graphs in the standard (x, y) coordinate plane, the solution set to the system of inequalities below is shown shaded. Which one?

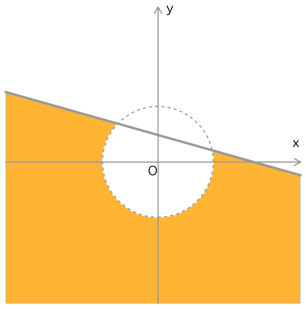
$$x + 2y \geq 6$$
$$3x^2 > 12 - 3y^2$$

F.


J.


G.


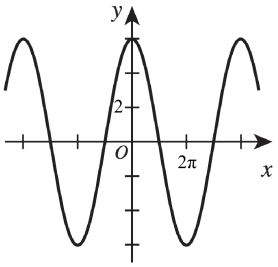
K.


H.


57. Let r, s, t, and u be real numbers. Given that $rt = 1$, $\frac{s+t}{u}$ is undefined, and $rst = u$, which of the following *must* be true?

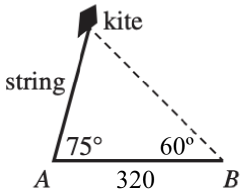
A. $r = 0$ or $t = 0$
B. $r = 1$ and $t = 1$
C. $r = -t$
D. $s = 0$
E. $s + t = 0$

58. A cosine function is shown in the standard (x, y) coordinate plane below. One of the following equations represents this function. Which one?



F. $y = \frac{1}{2}\cos(6x)$
G. $y = 2\cos(2x)$
H. $y = 2\cos\left(\frac{x}{2}\right)$
J. $y = 6\cos\left(\frac{x}{2}\right)$
K. $y = 6\cos(2x)$

59. The figure shows a flying kite. At a certain moment, the kite string forms an angle of elevation of 75° from point A on the ground. At the same moment, the angle of elevation of the kite at point B, 320 ft from A on level ground, is 60°. What is the length, in feet, of the string?



A. $80\sqrt{3}$
B. $160\sqrt{6}$
C. 135
D. 240
E. 320

60. A clothing store is having a sale. The first shirt that you buy is \$20 and then it is \$16 for each additional shirt bought. Which of the following expressions represents the cost of s shirts?

F. $16s + 4$
G. $16s + 20$
H. $20s - 4$
J. $20s + 4$
K. $20s + 16$