High School Math Study Guide Cycle 1

Correct answers are in bold

Evaluate variable expressions involving integers

1. Evaluate the expression for $u = 26$, $v = 4$, and $w = 5$.
   $v^2w - u =$
   A. 14 **B. 54** C. 106 D. 66
2. Evaluate the expression for $x = 9$, $y = {}^{-}9$, and $z = 14$.
   $xy - z =$
   A. 67 B. 4 **C.-95** D. 95

Evaluate Variable expressions involving rational numbers.

3. Evaluate the expression for $j = {}^{-}23$ and $k = {}^{-}7.5$.
   $j - k =$
   A. -15.5 B. -30.5 C. 30.5 D. 15.5

Sort/Classify rational and irrational numbers

4. Which number is irrational?
   A. √25 B. √16 C. √4 **D. √3**

5. Which number is rational?
   A. 3.1415 **B. √81** C. 2.7182 D.1.6180

Simplify variable expressions involving like terms and the distributive property

6. Simplify the expression: $-7m^2 + -6m^2 + -10m + -6$
   A. $13m^2 + 10m - 6$ B. **$-13m^2 - 10m + -6$** C. $13m^2 - 10m + 6$ D. $-13m^2 + 10m + 6$

Solve two-step linear inequalities.

7. Solve for f.
   $4 - 2y \leq -6$
   A. $y \leq 5$ B. $y \geq -5$ **C. $y \geq 5$** D. $y \leq -5$

Solve advanced linear inequalities

8. Solve for f.
   $2(q + 16) - 3 \leq -5$
   A. $q \geq -7$ B. $q \leq 17$ C. $q \geq -17$ **D. $q \leq -17$**

Solve Compound inequalities.

9. Which shows a compound inequality with integers?
   $12 \geq b + 20 > 3$
   A. $-17 < b \leq -8$ B. $-17 \leq b < -8$ C. $b \geq -8$ D. $b < -17$

Linear Functions

10. Find the slope from two points:
    (2, 13) and (9, 10)
    A. $-\frac{7}{3}$ **B. $-\frac{3}{7}$** C. $\frac{3}{7}$ D. $\frac{7}{3}$

Systems of Equations and Sequences

11. Is (5, 9) a solution to this system of inequalities?

$$y \leq x + 4$$
$$y < 3x + 8$$

No, it only satisfies one inequality.
No, because $9 > 9$.
Yes, because $9 < 23$ is false.
Yes, (5, 9) is a solution.

Evaluate variable expressions for number sequences.

12. Find the first four terms of the sequence defined below, where n represents the position of a term in the sequence. Start with $n = 1$.

$a_n = 3(4)^n$

12, 48, 192, 768
3, 12, 48, 192
4, 16, 64, 256
6, 24, 96, 384

13. Find the first four terms of the sequence defined below, where n represents the position of a term in the sequence. Start with $n = 1$.

$a_n = {}^{-}2n + 9$

9, 7, 5, 3
7, 5, 3, 1
-7, -5, -3, -1
1, 3, 5, 7

Linear and Exponential Functions

14. How much of a radioactive kind of neodymium will be left after 33 days if the half-life is 11 days and you start with 80 grams?

A. 10 grams B. 20 grams C. 5 grams D. 40 grams

15. Kimberly has $400 in an account that earns 5% interest compounded annually. To the nearest cent, how much will she have in 1 year?

A. $405 B. $440 C. $380 **D. $420**

Write linear and exponential functions from tables.

16. Look at this table: Write a linear function ($y=mx+b$) or an exponential function ($y=a(b)^x$) that models the data.

X	Y
0	-5
1	-10
2	-20
3	-40
4	-80

A. $y = -5x + 2$ **B. $y = -5(2)^x$** C. $y = -5(3)^x$ D. $y = -2(5)^x$

17. Look at this table: Write a linear function ($y=mx+b$) or an exponential function ($y=a(b)^x$) that models the data.

X	Y
1	8
2	16
3	32
4	64
5	128

A. $y = 8x + 2$ B. $y = 2(4)^x$ C. $y = 4(3)^x$ **D. $y = 4(2)^x$**

Exponential Functions Over Unit Intervals

18. Factor.

$2w^2 + 13w + 11$

(2w + 11) (w + 1)
(11w + 2) (w + 1)
(w + 1) (w + 11)
(w + 11) (w + 1)

19. Factor.

$x^4 + 10x^2 + 25$

$(x - 5)^2$
$(x^2 + 5)^2$
$(x^2 - 5)^2$
$(2x + 5)^2$

Mean, median, mode, and range

20. What is the median? 10, 4, 4, 6, 6, 1, 10, 7

5
6
7
4

21. What is the range? 5, 6, 10, 8, 9, 7, 7, 5, 5, 8, 8

10
6
8
5

Calculate quartiles and interquartile range.

22. In the data set below, what are the lower quartile, the median, and the upper quartile?

24, 25, 45, 63, 68, 87

Lower quartile = 25; Median = 54; Upper quartile = 68
Lower quartile = 24; Median = 45; Upper quartile = 87
Lower quartile = 25; Median = 63; Upper quartile = 68
Lower quartile = 24; Median = 54; Upper quartile = 87

23. In the data set below, what are the lower quartile, the median, and the upper quartile?

1, 1, 3, 3, 3, 4, 7, 8, 9, 9, 9

Lower quartile = 3; Median = 4; Upper quartile = 9
Lower quartile = 1; Median = 3; Upper quartile = 9
Lower quartile = 3; Median = 3; Upper quartile = 9
Lower quartile = 1; Median = 4; Upper quartile = 7

Variance and Standard Deviation

24. In the data set below, what is the variance?

5, 9, 5, 8, 4, 8

3.6
3.9
3.5
3.7

25. In the data set below, what is the variance?

4, 3, 5, 9, 3, 6

4.2
4.3
4.4
4.5

Algebra 2

Solve linear equations

26. Solve for u. $5u - 20 = -5u$

2
3
4
5

27. Solve for m.

$-4m + 15 = -9m - 15$

3
-5
-6
4

Evaluate functions

28. Use the following function rule to find $f(-2)$.

$f(x) = 7x - 12$

26
-26
-14
-2

29. Use the following function rule to find $f(-11)$.

$f(x) = 12x + 5$

-117
127
-127
-137

Introduction to complex numbers

30. Use the imaginary number i to rewrite the expression below as a complex number. Simplify all radicals.

$-\sqrt{-7}$

$-i\sqrt{7}$
$i\sqrt{7}$
$-7i$
$\sqrt{7}$

Add and subtract complex numbers

31. Simplify. Write your answer in the form $a + bi$.

$4i + 7i$

$4i - 7i = -3i$
$0 + 3i$
$0 + 11$
$0 + 11i$

32. Simplify. Write your answer in the form a + bi.

$9i - 3i$

$0 + -6i$
$0 + 3i$
$0 + 6i$
$0 + 12i$

Multiply complex numbers.

33. Simplify. Write your answer in the form a + bi.

$-3 * 5i$

0 - 15i
15i
-8i
15

Divide complex numbers

34. Simplify. Write your answer in the form a + bi.

5i/-2i

$5/2 + 0i$
$-5/2 + 0i$
$-5/2i + 4$
$5/2 - 10i$

35. Simplify. Write your answer in the form a + bi.

1/-10i

$0 + 1/10i$
$-1/10i + 0$
$-i/10 + 0$
$1/10 - 0$

Evaluate polynomials using synthetic division

36. If $h(u) = 33u^4 + 32u^3 - 2u^2 - 3u - 2$, use synthetic division to find $h(-1)$.

p(-1) = 0
p(-1) = -2
p(-1) = 2
p(-1) = 1

Factor by grouping

37. Factor completely.

$20r^3 + 10r^2 + 18r + 9$

$(2r + 3)(10r^2 + 1)$
$(r + 1)(20r^2 + 9)$
$(2r + 1)(10r^2 + 9)$
$(4r + 2)(5r^2 + 9)$

Factor using quadratic pattern

38. Factor completely.

$x^4 + 16x^2 + 64$

$(x^2 + 8)^2$
$(x^2 + 4)^2$
$(x^2 - 8)^2$
$(x^2 + 16)(x^2 + 4)$

39. Factor completely.

$x^4 - 18x^2 + 81$

$(x - 3)(x + 3)$
$(x - 9)(x + 9)$
$(x^2 + 9)^2$
$(x - 3)^2 (x + 3)^2$

Pascal's triangle and the Binomial Theorem

40. Use Pascal's Triangle to complete the expansion of $(v + w)^5$.

$v^5 + 5v^4w + 10v^3w^2 + 10v^2w^3 + 5vw^4 - w^5$
$v^5 + 6v^4w + 10v^3w^2 + 10v^2w^3 + 6vw^4 + w^5$
$v^5 + v^4w + 10v^3w^2 + 5v^2w^3 + 10vw^4 + w^5$
$v^5 + 5v^4w + 10v^3w^2 + 10v^2w^3 + 5vw^4 + w^5$

41. Use Pascal's Triangle to complete the expansion of $(w + x)^3$.

$w^3 + 3w^2x + 3wx^2 + x^3$
$w^3 + 2w^2x + 3wx^2 + x^3$
$w^3 + 3w^2x + 2wx^2 + x^3$
$w^3 + 3w^2x + 3wx^2 + \mathbf{2}x^3$

Solve radical equations.

42. Solve for j.

$17 = \sqrt{j}$

144
17
34
289

43. Solve for h.

$¼ = \sqrt{h}$

1/16
1/8
1/4
1/2

Add and subtract functions

44. What is (f + g) (x)?

f (x) = –3x + 2
g(x) = 4x

-7x + 2
x + 2
x – 2
-x + 2

Multiply functions

45. What is (f • g) (x)?

f (x) = $-2x^2$
g(x) = -5x + 4

$10x^3 - 8x^2$
$-10x^3 + 8x^2$
$-10x^3 - 8x^2$
$10x^2 - 8x$

Evaluate logarithms using properties

46. Use properties of logarithms to evaluate the expression.

$\log_5 25 + \log_5 5$

2
3
5
4

47. Use properties of logarithms to evaluate the expression.

$\text{Log}_4 4 + \log_4 16$

2
3
6
4

Solve exponential equations using common logarithms

48. Solve. Round your answer to the nearest thousandth.

$4 = 3^x$

x ≈ 0.874
x ≈ 2.000
x ≈ 1.500
x ≈ 1.262

Convert equations of parabolas from general to vertex form.

49. The equation of a parabola is $y = x^2 – 8x + 15$. Write the equation in vertex form.

$y = (x + 4)^2 – 1$
$y = (x – 4)^2 - 1$
$y = (x – 4)^2 + 1$
$y = (x + 4)^2 + 1$

Find properties of a parabola from equations in general form.

50. In which direction does the parabola $x - 8y^2 = 0$ open?

up
down
right
left

Write equations of circles in standard form using properties.

51. Write the equation in standard form for the circle with radius 9 centered at the origin.

$x^3 + y^2 = 81$
$x^2 + y^3 = 9$
$x^2 + y^2 = 81$
$x^2 + y^2 = 9$

Find trigonometric ratios using the unit circle.

52. The terminal side of an angle θ in standard position intersects the unit circle at 15/17, 8/17.
What is cos (θ)?

8/17
15/17
16/18
17/15

Sin, cos, tan of special angles.

53. Evaluate.
tan 60° =

$^1/_{\sqrt{3}}$
$\sqrt{3}$
1
2

Inverse of sin, cos, and tan: degrees.

54. $-90° \leq \theta \leq 90°$. Find the value of θ in degrees.
Tan (θ) = 1

-45
135
45
-60

Csc, sec, and cot of special angles.

55. Evaluate.
csc 45° =

$\sqrt{2}/2$
$\sqrt{2}$
2
½

Probability of independent and dependent events.

56. You toss the coin twice.
What is the probability of getting heads and then getting tails?

1/4
1/2
1/3
1/8

Counting Principle

57. Isabelle is ordering a sandwich from a deli. There are 4 types of meat to choose from and 3 bread choices. How many different sandwiches can Isabelle order?

7
10
12
16

Geometry

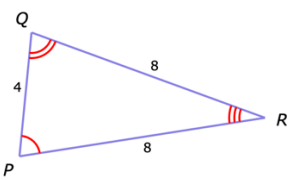
58. The intersection of a circle and rectangular hexagon can be _____.

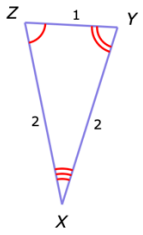
two line segments
a trapezoid
a triangle
two points

Use the Triangle Inequality Theorem

59. Find the ratio of a side length in $\triangle PQR$ to its corresponding side length in $\triangle ZYX$. (G9)

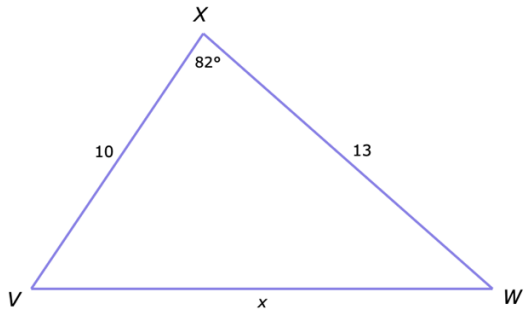
$\triangle PQR \sim \triangle ZYX$.





1/8
4
1/4
2

60. Find x. (G14)



15.1
15.2
15.3
15.4

Precalculus and Calculus

Functions

61. Use the following function rule to find $f(10)$.

$f(x) = 10 + 30/x$

***f*(10) = 13**
$f(10) = 40$
$f(10) = 3$
$f(10) = 25$

Polynomials

62. $98i$ is a root of $f(x) = x^2 + 9604$. Find the other roots of $f(x)$.

-98*i*
98
-98
√9604

Exponents, logarithms, and trignonometry

63. Solve.

$\log u + \log 10 = 1$

u = 1
u = 10
u = 0
u = 100

Vectors

64. Find the direction angle of $\mathbf{v} = \langle 8, 0 \rangle$. Round your answer to the nearest tenth of a degree.

0º
90º
45º
180º

Complex planes

65. Write $4\,[\cos(\pi/2) + i \sin(\pi/2)]$ in rectangular form. Simplify any radicals.

4i
4
-4i
0

Series

66. Use Pascal's Triangle to complete the expansion of $(u + v)^3$

$u^3 + 3u^2 v + ___ uv^2 + v^3$

3 uv^2
2 uv^2
uv^2
4 uv^2

67. Slope

Find the slope of the line that passes through (1,2) and (4,10).

Answer: m = 8/3

68. Systems of Equations

Solve the system:

$x+y=7, x-y=3x$

Answer: x = -7 and y = 14

69. Area of a Circle

Find the area of a circle with a radius of 7 cm. Use π=3.14.

Answer: r = 7

70. Volume of a Sphere

Find the volume of a sphere with a radius of 3 cm. Use π=3.14.

Answer: 113.04 cm^3

71. Scatterplots

What type of correlation exists in a scatterplot where points slope upward from left to right?

- **A)** Positive correlation
- **B)** Negative correlation
- **C)** No correlation
- **D)** Undefined correlation

Correct Answer: A) Positive correlation.

72. Exponential Decay

A car depreciates in value by 10% per year. If the initial value is $25,000, what is its value after 3 years?

- **A)** $22,500
- **B)** $18,225
- **C)** $20,000
- **D)** $19,665

Correct Answer: B.) $18,225

73. Complex Numbers

Simplify:

$(3 + 2i) + (4 - 5i)$

Answer: 7 - 3i

74. Linear Equations

What is the equation of a line that passes through the point (2,3)with a slope of 4?

75. Exponential Growth

The value of a car decreases by 20% each year. If its initial value is $25,000, what is its value after 2 years?

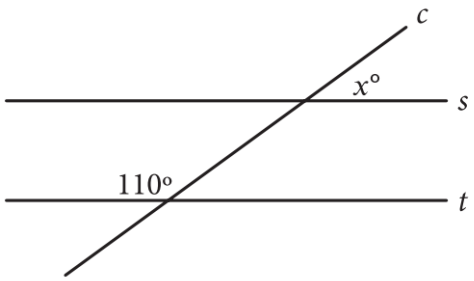
Answer: $16,000

76. Mean

The test scores are: 78, 85, 92, 88, 87. What is the mean?

Answer: 86

77.



Note: Figure not drawn to scale.

In the figure shown, line c intersects parallel lines s and t. What is the value of x ?

Answer: x = 70 degrees

Algebra

78. **What is the term for a polynomial with a degree of 2?**
    a) Linear
    b) Quadratic
    c) Cubic
    d) Quartic
    Correct Answer: b) Quadratic

79. **What is the term for a number that divides evenly into another number?**
    a) Factor
    b) Product
    c) Term
    d) Quotient
    Correct Answer: a) Factor

80. **What is the term for the steepness of a line?**
    a) Slope
    b) Intercept
    c) Vertex
    d) Axis
    Correct Answer: a) Slope

81. **What is the term for the solution to a system of equations?**
    a) Coefficient
    b) Intercept
    c) Intersection
    d) Constant
    Correct Answer: c) Intersection

82. **What is the term for a number in front of a variable in an expression?**
    a) Coefficient
    b) Constant
    c) Factor
    d) Term
    Correct Answer: a) Coefficient

83. **What is the term for a number not connected to a variable in an equation?**
    a) Variable
    b) Term
    c) Constant
    d) Coefficient
    Correct Answer: c) Constant

84. **What is the term for a set of numbers that follow a specific order or pattern?**
    a) Series
    b) Sequence
    c) Domain
    d) Range
    Correct Answer: b) Sequence

85. **What is the term for a function written as f(x)=ax2+bx+cf(x) = ax² + bx + cf(x)=ax2+bx+c?**
    a) Linear function
    b) Exponential function
    c) Quadratic function
    d) Logarithmic function
    Correct Answer: c) Quadratic function

86. **What is the term for a constant ratio in a geometric sequence?**
    a) Common difference
    b) Common ratio
    c) Reciprocal
    d) Arithmetic mean
    Correct Answer: b) Common ratio

Geometry

87. **What is the term for a three-dimensional object with a circular base and a vertex?**
    a) Cone
    b) Cylinder
    c) Sphere
    d) Pyramid
    Correct Answer: a) Cone

88. **What is the term for an angle that measures exactly 90 degrees?**
    a) Acute angle
    b) Obtuse angle

c) Right angle
d) Straight angle
Correct Answer: c) Right angle

89. **What is the term for the point where all the altitudes of a triangle meet?**
a) Orthocenter
b) Centroid
c) Circumcenter
d) Incenter
Correct Answer: a) Orthocenter

Statistics

90. **What is the term for the number that appears most frequently in a set of data?**
a) Mean
b) Median
c) Mode
d) Range
Correct Answer: c) Mode

91. **What is the term for a graph that shows the relationship between two variables?**
a) Pie chart
b) Line graph
c) Scatter plot
d) Histogram
Correct Answer: c) Scatter plot

92. **What is the term for the total number of outcomes in a probability experiment?**
a) Sample space
b) Event
c) Data set
d) Range
Correct Answer: a) Sample space

93. **What is the term for the difference between the predicted and actual values?**
a) Error
b) Residual
c) Range
d) Deviation
Correct Answer: b) Residual

94. **What is the term for an entire group being studied?**
a) Data set
b) Sample
c) Population
d) Category
Correct Answer: c) Population

95. **What is the term for the entire range of values a variable can take?**
    a) Domain
    b) Data set
    c) Probability
    d) Variance

    Correct Answer: a) Domain

Calculus

96. **What is the term for the area under a curve?**
    a) Integral
    b) Derivative
    c) Function
    d) Range
    Correct Answer: a) Integral
97. **What is the term for a value that a function approaches but never reaches?**
    a) Slope
    b) Limit
    c) Tangent
    d) Continuity
    Correct Answer: b) Limit

98. **What is the term for the highest point on a graph?**
    a) Minimum
    b) Maximum
    c) Inflection point
    d) Origin
    Correct Answer: b) Maximum

99. **What is the term for a curve that represents a function's rate of change?**
    a) Derivative
    b) Integral
    c) Function
    d) Slope
    Correct Answer: a) Derivative

100. **What is the term for a summation of infinitely many terms?**
    a) Infinite sequence
    b) Infinite series
    c) Limit
    d) Integral
    Correct Answer: b) Infinite series