

ACT Math • 100 Must-Know Problems

COMPLETE ACT MATH PREPARATION • ALL TOPICS • ASCENDING DIFFICULTY

Pre-Algebra TOPIC 1

1 PRE-ALGEBRA EASY

What is 15% of 240?

A 32

B 34

C 36

D 38

E 40

2 PRE-ALGEBRA EASY

If a shirt originally costs \$80 and is on sale for 25% off, what is the sale price?

A \$55

B \$60

C \$65

D \$70

E \$75

3 PRE-ALGEBRA EASY

What is the greatest common factor (GCF) of 48 and 72?

A 12

B 16

C 18

D 24

E 36

4

PRE-ALGEBRA EASY

The ratio of boys to girls in a class is 3:5. If there are 24 boys, how many girls are there?

A 32

B 36

C 40

D 42

E 45

5

PRE-ALGEBRA EASY

If the average of 5, 8, 12, x , and 15 is 10, what is x ?

A 7

B 8

C 9

D 10

E 11

6

PRE-ALGEBRA MEDIUM

A car travels 180 miles in 3 hours. At the same speed, how many miles does it travel in 5 hours?

A 260

B 280

C 300

D 320

E 360

Three consecutive even integers have a sum of 78. What is the largest integer?

A 24

B 26

C 28

D 30

E 32

A store marks up items by 40% and then offers a 20% discount. What is the net percent change from the original price?

A 8% decrease

B 8% increase

C 12% increase

D 20% increase

E 0% change

If $|2x - 3| = 7$, what are all possible values of x ?

A $x = 5$ only

B $x = -2$ only

C $x = 5$ or $x = -2$

D $x = 2$ or $x = -5$

E $x = 4$ or $x = -2$

10 PRE-ALGEBRA MEDIUM

A container holds $\frac{3}{4}$ of a gallon of liquid. If you pour out $\frac{1}{3}$ of what's in the container, how many gallons remain?

A $\frac{1}{2}$ B $\frac{7}{12}$ C $\frac{5}{8}$ D $\frac{11}{16}$ E $\frac{3}{8}$ **11** PRE-ALGEBRA HARD

A 60-liter solution is 40% acid. How many liters of pure acid must be added to make a 50% acid solution?

A 10

B 12

C 15

D 18

E 20

12 PRE-ALGEBRA HARD

If $2^x \cdot 4^y = 8^3$, and $x = 2y$, what is y ?

A 1

B 2

C 3

D 4

E 6

13 PRE-ALGEBRA HARD

The sum of three numbers is 120. The second is twice the first, and the third is 10 less than the second. What is the largest number?

A 40

B 44

C 46

D 48

E 50

14 PRE-ALGEBRA HARD

How many integers between 100 and 300 are divisible by both 3 and 5?

A 10

B 12

C 13

D 14

E 15

Algebra I TOPIC 2

15 ALGEBRA I EASY

Solve for x : $3x - 7 = 2x + 5$

A $x = 10$ B $x = 11$ C $x = 12$ D $x = 13$ E $x = 14$

Which of the following is equivalent to $(x + 3)(x - 5)$?

A $x^2 - 2x - 15$

B $x^2 - 8x - 15$

C $x^2 + 2x - 15$

D $x^2 - 2x + 15$

E $x^2 - 8x + 15$

If $f(x) = 2x^2 - 3x + 1$, what is $f(-2)$?

A 11

B 13

C 15

D 17

E 19

What are the solutions to $x^2 - 5x + 6 = 0$?

A $x=1$ and $x=6$

B $x=2$ and $x=3$

C $x=-2$ and $x=-3$

D $x=1$ and $x=-6$

E $x=-1$ and $x=6$

19 ALGEBRA I MEDIUM

The sum of a number and its reciprocal is $10/3$. What is the number? (positive solution)

A $1/3$

B $2/3$

C 1

D 3

E 4

20 ALGEBRA I MEDIUM

If $2x + 3y = 12$ and $x - y = 1$, what is y ?

A 1

B 2

C 3

D 4

E 5

21 ALGEBRA I MEDIUM

For what value(s) of x is $(x^2 - 4)/(x - 2)$ undefined?

A $x = 0$

B $x = 2$

C $x = -2$

D $x = \pm 2$

E $x = 4$

22 ALGEBRA I MEDIUM

A line passes through (2, 1) and (6, 9). What is its equation?

A $y=2x-3$

B $y=2x-5$

C $y=3x-5$

D $y=2x+1$

E $y=3x-7$

23 ALGEBRA I MEDIUM

If $\log_2(x) = 5$, what is x ?

A 10

B 16

C 25

D 32

E 64

24 ALGEBRA I MEDIUM

Which value of k makes $3x^2 + kx + 12$ a perfect square trinomial?

A 6

B 9

C 12

D 18

E 24

25

ALGEBRA I HARD

The quadratic equation $x^2 + bx + 9 = 0$ has exactly one real solution. Which of the following could be b ?

A -9

B -6

C -3

D 3

E 9

26

ALGEBRA I HARD

If $3^{(2x-1)} = 27$, what is x ?

A 1

B 2

C 3

D 4

E 5

27

ALGEBRA I HARD

For which values of x is $(x-1)/(x^2-x-6)$ positive?

A $x > 3$ onlyB $x < -2$ or $x > 3$

C -23

D 1

E $x < -2$ or 1

28

ALGEBRA I HARD

The function $f(x) = x^3 - 6x^2 + 9x$ has a local maximum at $x = ?$

A 0

B 1

C 2

D 3

E 4

29

ALGEBRA I HARD

If the roots of $x^2 - px + q = 0$ are r and s , which expression equals $r^2 + s^2$?

A $p^2 - 2q$ B $p^2 + 2q$ C $p^2 - q$ D $(p - q)^2$ E p^2

Coordinate Geometry TOPIC 3

30

COORDINATE GEOMETRY EASY

What is the distance between $(1, 2)$ and $(4, 6)$?

A 3

B 4

C 5

D 6

E 7

31 COORDINATE GEOMETRY EASY

What is the midpoint of the segment connecting $(-3, 4)$ and $(7, -2)$?

A $(2,1)$

B $(2,2)$

C $(3,1)$

D $(4,1)$

E $(2,3)$

32 COORDINATE GEOMETRY EASY

What is the slope of a line perpendicular to $y = 3x + 5$?

A 3

B -3

C $\frac{1}{3}$

D $-\frac{1}{3}$

E -5

33 COORDINATE GEOMETRY MEDIUM

A circle has center $(3, -1)$ and radius 5. Which point lies on the circle?

A $(8, -1)$

B $(3, 4)$

C $(0, 3)$

D $(-2, -1)$

E $(8, 2)$

The graph of $y = x^2$ is shifted 3 units right and 2 units down. What is the new equation?

A $y = (x+3)^2 - 2$

B $y = (x-3)^2 - 2$

C $y = (x-3)^2 + 2$

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

E $y = x^2 - 3x - 2$

What is the x-intercept of the line $4x - 3y = 12$?

A $(3,0)$

B $(4,0)$

C $(2,0)$

D $(6,0)$

E $(-4,0)$

Which equation represents a circle with center $(-2, 3)$ and diameter 10?

A $(x+2)^2 + (y-3)^2 = 10$

B $(x-2)^2 + (y+3)^2 = 25$

C $(x+2)^2 + (y-3)^2 = 25$

D $(x+2)^2 + (y+3)^2 = 25$

E $(x-2)^2 + (y-3)^2 = 100$

Two lines $y = 2x + 1$ and $y = -x + 7$ intersect at point P. What are the coordinates of P?

A (2,5)

B (3,7)

C (2,6)

D (3,4)

E (1,3)

What is the length of the chord cut from the circle $x^2 + y^2 = 25$ by the line $y = 3$?

A 4

B 6

C 8

D 10

E 12

The parabola $y = ax^2 + bx + c$ passes through (0,4), has vertex at $x = 1$, and passes through (2,4). What is a?

A -4

B -2

C -1

D 1

E 2

40 COORDINATE GEOMETRY **HARD**

Points A(1,1), B(5,1), C(5,4) form a triangle. What is the area?

A 4

B 6

C 8

D 10

E 12

41 COORDINATE GEOMETRY **HARD**

What is the equation of the line tangent to the circle $x^2+y^2=25$ at the point (3,4)?

A $3x+4y=25$

B $4x+3y=25$

C $3x-4y=25$

D $x+y=7$

E $x-y=-1$

42 COORDINATE GEOMETRY **HARD**

The line $y = mx + b$ is tangent to the parabola $y = x^2$. Which relationship must hold?

A $b = m^2/4$

B $b = -m^2/4$

C $b = m/4$

D $b = m^2$

E $b = 4m$

43 COORDINATE GEOMETRY HARD

Which of the following is the graph of an ellipse?

A $x^2 + y^2 = 9$

B $x^2 + 2y^2 = 8$

C $x^2 - y^2 = 4$

D $y = x^2 + 1$

E $y^2 = 4x$

44 COORDINATE GEOMETRY HARD

A point P divides the segment from A(0,0) to B(10,6) in the ratio 2:3. What are the coordinates of P?

A (4,2.4)

B (4,2.4)

C (3,1.8)

D (6,3.6)

E (2,1.2)

Plane Geometry TOPIC 4

45 PLANE GEOMETRY EASY

In a right triangle, the two legs have lengths 6 and 8. What is the length of the hypotenuse?

A 9

B 10

C 11

D 12

E 14

46

PLANE GEOMETRY EASY

The interior angles of a triangle are in the ratio 2:3:4. What is the largest angle?

A 60° B 70° C 80° D 90° E 100°

47

PLANE GEOMETRY EASY

A rectangle has perimeter 36 cm and width 7 cm. What is its area?

A 77 cm^2 B 91 cm^2 C 98 cm^2 D 105 cm^2 E 110 cm^2

48

PLANE GEOMETRY MEDIUM

In a circle with radius 6, what is the area of a sector with central angle 90° ?

A 6π B 9π C 12π D 18π E 36π

49

PLANE GEOMETRY MEDIUM

Two parallel lines are cut by a transversal. One angle is 65° . What is its co-interior (same-side interior) angle?

A 65° B 115° C 125° D 25° E 155°

50

PLANE GEOMETRY MEDIUM

The area of an equilateral triangle with side length 6 is:

A $9\sqrt{3}$ B $12\sqrt{3}$

C 18

D $6\sqrt{3}$

E 12

51

PLANE GEOMETRY MEDIUM

A trapezoid has parallel sides of length 8 and 12, and a height of 5. What is its area?

A 40

B 50

C 60

D 70

E 80

A diagonal of a square measures 10 cm. What is the area of the square?

- A 25 cm^2
- B 50 cm^2
- C 70 cm^2
- D 100 cm^2
- E $25\sqrt{2} \text{ cm}^2$

In triangle ABC, angle A = 50° , angle B = 70° . What is the exterior angle at C?

- A 60°
- B 100°
- C 120°
- D 130°
- E 140°

A cone has base radius 3 and height 4. What is its total surface area?

- A 15π
- B 21π
- C 24π
- D 24
- E 30π

Two circles with radii 5 and 3 are externally tangent. What is the distance between their centers?

A 2

B 5

C 8

D 10

E 15

In a right triangle, the altitude from the right angle to the hypotenuse has length 6. If the hypotenuse is 13, what is the length of one leg? (shorter)

A 4

B 5

C 6

D 7

E 8

A regular hexagon has side length 4. What is its area?

A $24\sqrt{3}$

B $32\sqrt{3}$

C $48\sqrt{3}$

D $16\sqrt{3}$

E $36\sqrt{3}$

The perimeter of a sector with radius 10 and arc length 8π is:

A $8\pi+10$

B $8\pi+20$

C $8\pi+5$

D $10\pi+20$

E $16\pi+10$

Algebra II TOPIC 5

What is the sum of the infinite geometric series $12 + 6 + 3 + 1.5 + \dots$?

A 18

B 20

C 24

D 30

E 36

If $i = \sqrt{-1}$, what is i^{35} ?

A 1

B -1

C i

D $-i$

E 0

61 ALGEBRA II MEDIUM

Which is equivalent to $\sqrt{50} - \sqrt{18}$?

A $2\sqrt{2}$

B $4\sqrt{2}$

C $\sqrt{32}$

D $3\sqrt{2}$

E $\sqrt{8}$

62 ALGEBRA II MEDIUM

The 7th term of an arithmetic sequence is 31, and the 12th term is 51. What is the first term?

A 3

B 5

C 7

D 9

E 11

63 ALGEBRA II MEDIUM

Simplify: $(x^2 - 9)/(x^2 + 5x + 6)$

A $(x+3)/(x+2)$

B $(x-3)/(x+2)$

C $(x-3)/(x+3)$

D $(x+3)/(x-2)$

E $(x-3)/(x-2)$

64

ALGEBRA II HARD

How many real solutions does $x^4 - 5x^2 + 4 = 0$ have?

A 0

B 1

C 2

D 3

E 4

65

ALGEBRA II HARD

A polynomial has roots -2 , 1 , and 3 . Which could be $f(x)$?

A $x^3 - 2x^2 - 5x + 6$ B $x^3 + 2x^2 - 5x - 6$ C $x^3 - 2x^2 + 5x + 6$ D $x^3 + 2x^2 + 5x - 6$ E $x^3 - 4x^2 + x + 6$

66

ALGEBRA II HARD

If $\log(x) + \log(x-3) = 1$, what is x ? (base 10)

A 2

B 5

C 10

D 4

E 8

What is the remainder when $2x^3 - 3x^2 + x - 5$ is divided by $(x - 2)$?

A -5

B -3

C 1

D 3

E 5

If $f(x) = e^x$ and $g(x) = \ln(x)$, what is $f(g(3))$?

A e^3

B 3

C $\ln 3$

D 1

E e

The function $f(x) = 2 \cdot 3^x$ has which of these properties?

A Decreasing; y-intercept at (0,3)

B Increasing; y-intercept at (0,2)

C Decreasing; y-intercept at (0,2)

D Increasing; y-intercept at (0,6)

E Constant; y-intercept at (0,2)

Which of the following has no real solutions? (x is real)

A $x^2+4=0$

B $x^2-4=0$

C $x^2+4x+4=0$

D $x^2-4x+4=0$

E $x^2+4x-4=0$

A function is defined as $f(x) = (x+2)/(x^2-4)$. What is its domain?

A All reals

B All reals except $x=2$

C All reals except $x=\pm 2$

D All reals except $x=-2$

E $x>2$

For what values of x does the inequality $x^2 < 4x$ hold?

A 0

B $x<0$ or $x>4$

C $x>0$

D $0\leq x\leq 4$

E $x<4$

73

TRIGONOMETRY EASY

In a right triangle, $\sin(\theta) = 3/5$. What is $\cos(\theta)$?

A $3/4$ B $4/5$ C $3/5$ D $5/3$ E $4/3$

74

TRIGONOMETRY EASY

What is the value of $\tan(45^\circ)$?

A 0

B $1/2$ C $\sqrt{2}/2$

D 1

E $\sqrt{3}$

75

TRIGONOMETRY MEDIUM

If $\cos(\theta) = -\sqrt{3}/2$ and $0^\circ \leq \theta \leq 360^\circ$, what are the possible values of θ ?

A 120° and 240° B 150° and 210° C 60° and 300° D 30° and 330° E 120° and 300°

76

TRIGONOMETRY

MEDIUM

What is the period of $y = 3\sin(2x)$?

A $\pi/2$ B π C 2π D 3π E 6π

77

TRIGONOMETRY

MEDIUM

Which of the following equals $\sin(2\theta)$?

A $2\sin(\theta)$ B $2\sin(\theta)\cos(\theta)$ C $\sin^2(\theta) - \cos^2(\theta)$ D $2\cos^2(\theta) - 1$ E $1 - 2\sin^2(\theta)$

78

TRIGONOMETRY

MEDIUM

In triangle ABC, side $a=7$, side $b=8$, and angle $C=60^\circ$. What is side c ?

A $\sqrt{57}$ B $\sqrt{57}+1$

C 8

D $\sqrt{73}$ E $\sqrt{64}$

What is the amplitude of $y = -4\cos(3x) + 1$?

A -4

B 1

C 3

D 4

E 5

If $\tan(\alpha) = 4/3$ and α is in Quadrant III, what is $\sin(\alpha)$?

A $4/5$

B $-4/5$

C $3/5$

D $-3/5$

E $-3/4$

Solve $\sin(x) = \cos(x)$ for $0 \leq x < 2\pi$.

A $x=\pi/4$ only

B $x=\pi/4$ and $x=5\pi/4$

C $x=\pi/2$

D $x=\pi/4$ and $x=3\pi/4$

E $x=5\pi/4$ only

82

TRIGONOMETRY HARD

Which expression is equivalent to $\cos^2(x) - \sin^2(x)$?

A $\cos(2x)$

B $\sin(2x)$

C $1 - 2\sin^2(x)$

D $2\cos^2(x) - 1$

E Both A and C

83

TRIGONOMETRY HARD

What is the exact value of $\sin(75^\circ)$?

A $(\sqrt{6} + \sqrt{2})/4$

B $(\sqrt{6} - \sqrt{2})/4$

C $(\sqrt{3} + 1)/4$

D $\sqrt{2}/2$

E $(\sqrt{3} + \sqrt{2})/4$

84

TRIGONOMETRY HARD

In a triangle, angle $A = 30^\circ$, side $a = 5$, side $b = 8$. Using the Law of Sines, how many triangles are possible?

A 0

B 1

C 2

D 3

E Cannot be determined

Which of the following is the inverse function of $y = \sin(x)$ on $[-\pi/2, \pi/2]$?

A $y = \arcsin(x)$, domain $[-1, 1]$

B $y = 1/\sin(x)$

C $y = \cos(x)$

D $y = \arctan(x)$

E $y = \sin(1/x)$

What is the phase shift of $y = \sin(2x - \pi/3)$?

A $\pi/3$ to the right

B $\pi/6$ to the right

C $\pi/3$ to the left

D $\pi/6$ to the left

E $2\pi/3$ to the right

If $\csc(\theta) = 2$ and θ is acute, what is $\cos(2\theta)$?

A $1/4$

B $1/2$

C $\sqrt{3}/2$

D $-1/2$

E $3/4$

88

STATISTICS MEDIUM

A bag has 4 red, 3 blue, and 5 green marbles. What is the probability of drawing a red marble?

A $\frac{1}{3}$ B $\frac{4}{12}$ C $\frac{1}{4}$ D $\frac{3}{12}$ E $\frac{5}{12}$ **89**

STATISTICS MEDIUM

The mean of 5 numbers is 12. One number is removed, and the new mean of the remaining 4 numbers is 10. What was the number removed?

A 15

B 18

C 20

D 22

E 25

90

STATISTICS MEDIUM

A die is rolled twice. What is the probability of getting a sum of 7?

A $\frac{1}{6}$ B $\frac{5}{36}$ C $\frac{6}{36}$ D $\frac{7}{36}$ E $\frac{1}{12}$

91 STATISTICS HARD

A data set has mean=50 and standard deviation=5. A z-score of 2.4 corresponds to what data value?

A 52

B 55

C 60

D 62

E 65

92 STATISTICS HARD

From a group of 5 men and 4 women, a committee of 3 is chosen. How many ways can the committee have exactly 2 men?

A 20

B 30

C 40

D 50

E 60

93 STATISTICS HARD

In a normal distribution, approximately what percent of data falls within 2 standard deviations of the mean?

A 68%

B 75%

C 90%

D 95%

E 99.7%

94

STATISTICS HARD

A box contains 10 cards numbered 1–10. Two cards are drawn without replacement. What is the probability both are even?

A $1/4$ B $2/9$ C $5/18$ D $4/9$ E $1/5$

95

STATISTICS HARD

If events A and B are independent, $P(A)=0.4$ and $P(B)=0.5$, what is $P(A \cup B)$?

A 0.20

B 0.70

C 0.72

D 0.90

E 0.80

Answer Key

1. C	2. B	3. D	4. C	5. D
6. C	7. C	8. B	9. C	10. A
11. B	12. C	13. D	14. C	15. C
16. A	17. C	18. B	19. D	20. B
21. B	22. A	23. D	24. D	25. B
26. B	27. C	28. B	29. A	30. C
31. A	32. D	33. A	34. B	35. A
36. C	37. A	38. C	39. A	40. B
41. A	42. B	43. B	44. A	45. B
46. C	47. A	48. B	49. B	50. A
51. B	52. B	53. C	54. C	55. C
56. B	57. A	58. B	59. C	60. D
61. A	62. A	63. B	64. D	65. A
66. B	67. D	68. B	69. B	70. A
71. B	72. A	73. B	74. D	75. B
76. B	77. B	78. A	79. D	80. B
81. B	82. E	83. A	84. C	85. A
86. B	87. B	88. A	89. C	90. C
91. D	92. B	93. D	94. B	95. B