
5 ALGEBRA

If (x, y) solves $2x + 5y = 29$ and $5x + 2y = 27$, what is $x + y$?

Answer

6 ADVANCED MATH

If (x, y) solves $y = x^2 - 4x + 7$ and $y = 2x - 2$, what is $x + y$?

(A) 4

(B) 3

(C) 7

(D) 11

7 ALGEBRA

How many integers x satisfy $-4 < 3 - 2x \leq 11$?

(A) 8

(B) 7

(C) 9

(D) 6

8 PROBLEM SOLVING AND DATA

A box contains 5 red marbles and 3 blue marbles. Two marbles are drawn at random without replacement. If the first marble drawn is red, what is the probability that the second marble is blue?

(A) $\frac{2}{7}$

(B) $\frac{5}{8}$

(C) $\frac{3}{7}$

(D) $\frac{3}{8}$

9 ADVANCED MATH

If $2^{x+1} + 2^{x+1} = 32$, what is the value of x ?

Answer

10 ALGEBRA

Line m passes through $(-2, 5)$ and $(4, 1)$. Line k is perpendicular to m through $(1, 2)$. What is the x-intercept of k ?

(A) $(-\frac{1}{3}, 0)$

(B) $(2, 0)$

(C) $(0, \frac{1}{2})$

(D) $(-\frac{1}{2}, 0)$

11 ADVANCED MATH

How many distinct real solutions do the graphs of $y = x^2 - 3x + 5$ and $y = x + 1$ have?

- (A) Exactly one (B) Infinitely many
(C) Zero (D) Exactly two
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12 PROBLEM SOLVING AND DATA

In a survey of 200 residents, 120 own a dog, 70 own a cat, and 40 own both. If one resident is selected at random, what is the probability that this resident owns neither a dog nor a cat?

- (A) $\frac{1}{4}$ (B) $\frac{3}{4}$
(C) $\frac{1}{5}$ (D) $\frac{11}{20}$
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13 ADVANCED MATH

What is the solution to $\sqrt{x + 10} = x - 2$?

Answer

14 ALGEBRA

What is the sum of all distinct real solutions to $|3x - 14| = 2x + 1$?

Answer

15 GEOMETRY AND TRIGONOMETRY

In right triangle ABC, the legs have lengths 7 and 24. What is the value of $\sin A$, where A is the smaller acute angle?

- (A) $\frac{24}{7}$ (B) $\frac{7}{25}$
(C) $\frac{24}{25}$ (D) $\frac{7}{24}$
-

16 ADVANCED MATH

$3x^2 - 12x + (2k - 1) = 0$ has two distinct real solutions. Which inequality is equivalent to the condition on k ?

- (A) $k < \frac{25}{2}$ (B) $k < \frac{13}{2}$
(C) $k > \frac{13}{2}$ (D) $k > 6$
-

17 ALGEBRA

If (x, y) solves $4x + 3y = 29$ and $8x - 5y = 14$, what is $12x - 2y$?

Answer

18 ADVANCED MATH

If $9^{2x+1} = 27^{x+4}$, what is x ?

(A) 3

(B) 14

(C) 10

(D) 6

19 GEOMETRY AND TRIGONOMETRY

The radius of circle B is 3 times the radius of circle A. The area of circle B is how many times the area of circle A?

(A) 1.5

(B) 9

(C) 3

(D) 6

20 ALGEBRA

In $kx + 6y = 18$ and $4x + my = 12$, the system has infinitely many solutions. What is $k + m$?

(A) 8

(B) 12

(C) 10

(D) 15

21 ADVANCED MATH

$f(x) = 3x - 5$, $g(x) = x^2 + 2$. What is $f(g(3)) - g(f(3))$?

Answer

22 ALGEBRA

A club orders 30 kits. A small kit costs \$8 and a deluxe kit costs \$15. The total is more than \$310 but less than \$330. What is the greatest possible number of deluxe kits?

(A) 12

(B) 11

(C) 13

(D) 14

Answer key

#	ANSWER	TOPIC
1	B	Systems Of Equations
2	B	Quadratics
3	D	Percentages
4	D	Right Triangles
5	8	Systems Of Equations
6	C	Quadratics
7	A	Linear Inequalities
8	C	Probability
9	3	Exponents
10	A	Linear Functions
11	A	Quadratics
12	A	Probability
13	6	Functions
14	17.6 or 88/5	Absolute Value
15	B	Trigonometry
16	B	Quadratics
17	43	Systems Of Equations
18	C	Exponential Functions
19	B	Circles
20	C	Systems Of Equations
21	10	Functions
22	A	Word Problems

Worked solutions

1 **B**

HOW Multiply the first equation by 3: $9x + 3ky = 45$. For no solution with $9x + 6y = 30$, the y-coefficients must match but the constants differ: $3k = 6$, so $k = 2$, and $45 \neq 30$.

COMMON MISTAKE Picking the value that makes the system identical ($k = 2$ with constants also matching) or confusing no-solution with infinitely-many.

2 **B**

HOW $x = 2$, so $y = -2(4) + 16 = 8$.

COMMON MISTAKE Using the vertex x-value as the answer, or a sign error in the vertex formula.

3 **D**

HOW The combined multiplier is $1.25(0.8) = 1$, so the final price equals the original: 100%.

COMMON MISTAKE Adding 25% and -20% to get a 5% increase, which ignores that the decrease applies to the raised price.

4 **D**

HOW The hypotenuse is 10, and the area is $(1/2)(6)(8) = 24$. Using the hypotenuse as the base: $24 = (1/2)(10)h$, so $h = 4.8$.

COMMON MISTAKE Answering the area (24) or halving 4.8 to 2.4 without a reason.

5 **8**

HOW $7x + 7y = 56$, so $x + y = 8$.

COMMON MISTAKE Solving the full system the slow way and slipping.

6 **C**

HOW $x^2 - 6x + 9 = 0$, so $x = 3$ and $y = 4$. Sum: $3 + 4 = 7$.

COMMON MISTAKE Answering only x or only y . The question asks for their sum.

7 **A**

HOW $-7 < -2x \leq 8$ becomes $-4 \leq x < 3.5$: 8 integers from -4 to 3.

COMMON MISTAKE Forgetting to flip, or miscounting an endpoint.

8 **C**

HOW After removing a red marble, 4 red and 3 blue remain, for 7 total. The probability the second marble is blue is $\frac{3}{7}$. Check: the denominator dropped from 8 to 7 because one marble was removed.

COMMON MISTAKE Keeping the original total of 8 and reporting $\frac{3}{8}$.

9 3

HOW $2^{x+2} = 2^5$, so $x + 2 = 5$ and $x = 3$.

COMMON MISTAKE Treating $2^{x+1} + 2^{x+1}$ as 2^{2x+2} (adding exponents when adding like terms).

10 A

HOW Slope of m is $-\frac{2}{3}$, so k has slope $\frac{3}{2}$: $y = \frac{3}{2}x + \frac{1}{2}$. At $y = 0$: $x = -\frac{1}{3}$.

COMMON MISTAKE Using m 's slope for k , or answering the y-intercept instead.

11 A

HOW $x^2 - 4x + 4 = 0$. Discriminant $16 - 16 = 0$: exactly one intersection, at $(2, 3)$.

COMMON MISTAKE Confusing zero discriminant (one tangent point) with no solution.

12 A

HOW Residents owning at least one type number $120 + 70 - 40 = 150$. So $200 - 150 = 50$ own neither, and the probability is $50/200 = 1/4$. Check: $150 + 50 = 200$ accounts for everyone.

COMMON MISTAKE Adding $120 + 70 = 190$ without subtracting the 40 double-counted residents.

13 6

HOW Squaring: $x + 10 = x^2 - 4x + 4$, so $x = 6$ or $x = -1$. Checking: $x = -1$ gives $3 = -3$ (false). Only $x = 6$.

COMMON MISTAKE Keeping the extraneous root -1. Squaring can invent solutions, so always verify.

14 17.6 OR 88/5

HOW Cases give $x = 15$ and $x = 13/5$, both valid. Sum: $15 + 2.6 = 17.6$.

COMMON MISTAKE Keeping only one case, or forgetting to verify each root.

15 B

HOW The hypotenuse is $\sqrt{7^2 + 24^2} = 25$. The smaller acute angle is opposite the shorter leg, so $\sin A = 7/25$. Check: $\sin A$ should be less than $\sin 45^\circ$, and $7/25 = 0.28$ is indeed small.

COMMON MISTAKE Taking the ratio of the adjacent leg to the hypotenuse, which is $24/25$, or using the legs directly for a tangent value.

16 B

HOW $144 - 12(2k - 1) > 0$, so $156 - 24k > 0$ and $k < 13/2$.

COMMON MISTAKE Flipping the inequality, or confusing $>$ with $\geq$.

17 43

HOW Adding directly: $(4x + 3y) + (8x - 5y) = 29 + 14$, so $12x - 2y = 43$. No solving needed.

COMMON MISTAKE Solving the full system the slow way and slipping in arithmetic.

18 C

HOW $3^{4x+2} = 3^{3x+12}$, so $x = 10$.

COMMON MISTAKE Equating the exponents of 9 and 27 directly without unifying the base.

19 B

HOW If circle A has radius r , then circle B has radius $3r$. The areas are πr^2 and $\pi(3r)^2 = 9\pi r^2$, so the area is 9 times as large. Check: the factor is 3^2 .

COMMON MISTAKE Reporting 3 by scaling the area the same way as the radius.

20 C

HOW $k/4 = 6/m = 18/12 = 3/2$, so $k = 6$, $m = 4$. Sum: 10.

COMMON MISTAKE Matching only two ratios, or solving for one constant and stopping.

21 10

HOW $f(11) = 28$; $g(4) = 18$. Difference: 10.

COMMON MISTAKE Composing in the wrong order on either side.

22 A

HOW $310 < 240 + 7d < 330$, so $10 < d < 12.86$. Integer options 11, 12. Maximum: 12.

COMMON MISTAKE Rounding 12.86 up to 13, which breaks the \$330 cap.
