COLLEGE READINESS INITIATIVE

Math-No Calculator

1

If $\frac{x-1}{3} = k$ and $k = 3$, what is the value of x ?

A) 2
B) 4
C) 9
D) 10

Answer: D

$$\frac{x-1}{3} = k$$

$$3k = x - 1$$

$$k = 3$$

$$3(3) + 1 = x$$

$$x = 9 + 1 = 10$$

$$x = 10$$

Written by Liam Mulcahy

Heart of Algebra

2

For $i = \sqrt{-1}$, what is the sum $(7 + 3i) + (-8 + 9i)$?

A) $-1 + 12i$
B) $-1 - 6i$
C) $15 + 12i$
D) $15 - 6i$

Answer: A

$$(7 + 3i) + (-8 + 9i)$$

$$= (-1 + 12i)$$

$$-1 + 12i$$

Written by Liam Mulcahy

3

On Saturday afternoon, Armand sent m text messages each hour for 5 hours, and Tyrone sent p text messages each hour for 4 hours. Which of the following represents the total number of messages sent by Armand and Tyrone on Saturday afternoon?

A) $9mp$
B) $20mp$
C) $5m + 4p$
D) $4m + 5p$

Answer: C

$5m + 4p$

Written by Liam Mulcahy

Heart of Algebra

4

Kathy is a repair technician for a phone company. Each week, she receives a batch of phones that need repairs. The number of phones that she has left to fix at the end of each day can be estimated with the equation $P = 108 - 23d$, where P is the number of phones left and d is the number of days she has worked that week. What is the meaning of the value 108 in this equation?

A) Kathy will complete the repairs within 108 days.
B) Kathy starts each week with 108 phones to fix.
C) Kathy repairs phones at a rate of 108 per hour.
D) Kathy repairs phones at a rate of 108 per day.

Answer: B

Set d=0, then P=108 that means that she starts the week with 108 phones to fix.

Written by Liam Mulcahy

Heart of Algebra

5

$$(x^2y - 3y^2 + 5xy^2) - (-x^2y + 3xy^2 - 3y^2)$$

Which of the following is equivalent to the expression above?

A) $4x^2y^2$
B) $8xy^2 - 6y^2$
C) $2x^2y + 2xy^2$
D) $2x^2y + 8xy^2 - 6y^2$

Answer: C

$$(x^2y - 3y^2 + 5xy^2) - (-x^2y + 3xy^2 - 3y^2)$$

$$2x^2y - 2xy^2$$

Written by Liam Mulcahy

Passport to Advanced Math

6

$$h = 3a + 28.6$$

A pediatrician uses the model above to estimate the height h of a boy, in inches, in terms of the boy's age a, in years, between the ages of 2 and 5. Based on the model, what is the estimated increase, in inches, of a boy's height each year?

A) 3
B) 5.7
C) 9.5
D) 14.3

Answer: A

Since a is in terms of years each year a will increase by 1 causing h to increase by 3(a)

Written by Liam Mulcahy

Heart of Algebra

7

$$m = \frac{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^{N}}{\left(1+\frac{r}{1{,}200}\right)^{N}-1}P$$

The formula above gives the monthly payment m needed to pay off a loan of P dollars at r percent annual interest over N months. Which of the following gives P in terms of m, r, and N ?

A) $P = \frac{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^{N}}{\left(1+\frac{r}{1{,}200}\right)^{N}-1}m$

B) $P = \frac{\left(1+\frac{r}{1{,}200}\right)^{N}-1}{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^{N}}m$

C) $P = \left(\frac{r}{1{,}200}\right)m$

D) $P = \left(\frac{1{,}200}{r}\right)m$

Answer: B

$$m = \frac{\left(\frac{r}{1200}\right)\left(1+\frac{r}{1200}\right)^{N}}{\left(1+\frac{r}{1200}\right)^{N}-1}P$$

$$m = \frac{\left(\frac{r}{1200}\right)\left(1+\frac{r}{1200}\right)^{N}}{\left(1+\frac{r}{1200}\right)^{N}-1}P$$

$$m\frac{\left(1+\frac{r}{1200}\right)^{N}-1}{\left(\frac{r}{1200}\right)\left(1+\frac{r}{1200}\right)^{N}} = P$$

Can treat large numerator and denominator as a single variable and multiply across.

Written by Liam Mulcahy

Passport to Advanced Math

8

If $\frac{a}{b} = 2$, what is the value of $\frac{4b}{a}$?

A) 0

B) 1

C) 2

D) 4

Answer: C

$\frac{a}{b} = 2$ So

$\frac{a}{b} = \frac{2}{1}$ $\frac{b}{a} = \frac{1}{2}$ and $\frac{1}{2} \times 4 = 2$

Written by Liam Mulcahy

Passport to Advanced Math

9

$$3x + 4y = -23$$
$$2y - x = -19$$

What is the solution (x, y) to the system of equations above?

A) $(-5, -2)$

B) $(3, -8)$

C) $(4, -6)$

D) $(9, -6)$

Answer: B

$$3x + 4y = -23$$
$$-x + 2y = -19$$

$$3x + 4y = -23$$
$$(-x + 2y) * 3 = (-19) * 3$$

$$10y = -80$$

$$y = -8$$

Written by Liam Mulcahy

Heart of Algebra

10

$$g(x) = ax^2 + 24$$

For the function g defined above, a is a constant and $g(4) = 8$. What is the value of $g(-4)$?

A) 8

B) 0

C) -1

D) -8

Answer: A

We realize that g(4) = g(-4) because of the x^2

Written by Liam Mulcahy

Passport to Advanced Math

11

$$b = 2.35 + 0.25x$$
$$c = 1.75 + 0.40x$$

In the equations above, b and c represent the price per pound, in dollars, of beef and chicken, respectively, x weeks after July 1 during last summer. What was the price per pound of beef when it was equal to the price per pound of chicken?

A) \$2.60

B) \$2.85

C) \$2.95

D) \$3.35

Answer: D

$$b = 2.35 + 0.25x$$

$$c = 1.75 + 0.40x$$

$$2.35 + 0.25x = 1.75 + 0.40x$$

$$0.6 = 0.15x$$

$$x = 4$$

$$b = 2.35 + 0.25(4)$$

$$b = 3.35$$

Written by Liam Mulcahy

Heart of Algebra

12

A line in the xy-plane passes through the origin and has a slope of $\frac{1}{7}$. Which of the following points lies on the line?

A) $(0, 7)$

B) $(1, 7)$

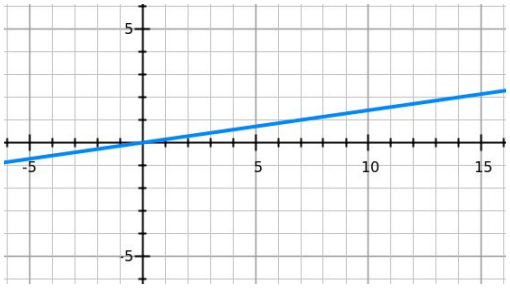
C) $(7, 7)$

D) $(14, 2)$

Answer: D

Rise 1 Go Over 7

Points include (0,0), (7,1), **(14,2)**



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Heart of Algebra

13

If $x > 3$, which of the following is equivalent to $\dfrac{1}{\frac{1}{x+2}+\frac{1}{x+3}}$?

A) $\dfrac{2x+5}{x^2+5x+6}$

B) $\dfrac{x^2+5x+6}{2x+5}$

C) $2x+5$

D) x^2+5x+6

Answer: B

$$\frac{1}{\frac{1}{x+2}+\frac{1}{x+3}}$$

$$\frac{1}{\frac{(x+3)+(x+2)}{(x+2)(x+3)}}$$

$$\frac{(x+2)(x+3)}{(x+3)+(x+2)} = \frac{(x^2+2x+3x+6)}{(x+3)+(x+2)}$$

$$\frac{(x^2+5x+6)}{(x+3)+(x+2)}$$

$$\frac{(x^2+5x+6)}{2x+5}$$

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Passport to Advanced Math

14

If $3x - y = 12$, what is the value of $\frac{8^x}{2^y}$?

A) 2^{12}

B) 4^4

C) 8^2

D) The value cannot be determined from the information given.

Answer: A

$3x - y = 12 \qquad 3x = y + 12$

$x = \frac{y}{3} + 4$

$8 = 2^3$

$$\frac{8^x}{2^y} = \frac{2^{3x}}{2^y} = \frac{2^{3(\frac{y}{3}+4)}}{2^y} = \frac{2^{(y+12)}}{2^y} = 2^{12}$$

Written by Liam Mulcahy

Passport to Advanced Math

15

If $(ax + 2)(bx + 7) = 15x^2 + cx + 14$ for all values of x, and $a + b = 8$, what are the two possible values for c ?

A) 3 and 5

B) 6 and 35

C) 10 and 21

D) 31 and 41

Answer: D

We know that (a x b) = 15 and (a+b) =8

So either {a=5, b=3} or {a=3, b=5}

$(ax + 2)(bx + 7)$

Taking both of these cases

$(5x + 2)(3x + 7)$ $(15x^2 + 35x) + (6x + 14)$ $15x^2 + 41x + 14$	$(3x + 2)(5x + 7)$ $(15x^2 + 21x) + (10x + 14)$ $15x^2 + 31x + 14$

c = 31 or c = 41

Written by Liam Mulcahy

Passport to Advanced Math

16

If $t > 0$ and $t^2 - 4 = 0$, what is the value of t ?

Answer: 2

$$t^2 - 4 = 0$$

$$t^2 = 4$$

$$t = \sqrt{4} = 2$$

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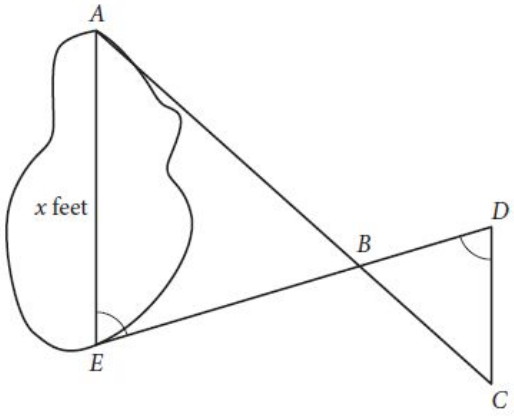
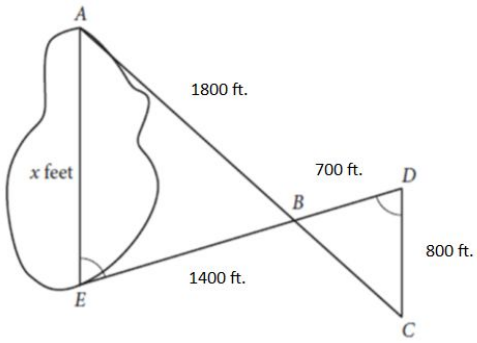
Passport to Advanced Math

17



A summer camp counselor wants to find a length, x, in feet, across a lake as represented in the sketch above. The lengths represented by AB, EB, BD, and CD on the sketch were determined to be 1800 feet, 1400 feet, 700 feet, and 800 feet, respectively. Segments AC and DE intersect at B, and $\angle AEB$ and $\angle CDB$ have the same measure. What is the value of x ?

Answer: 1600



Triangles ABE and BDC are similar, because we know side-angle-side(SAS). So if BE is twice length of BD, then x is twice the length of DC. 2x 800= 1600

18

$$x + y = -9$$
$$x + 2y = -25$$

According to the system of equations above, what is the value of x ?

Answer: 7

$$x + y = -9$$
$$x + 2y = -25$$

$$-2(x + y) = -2(-9) \rightarrow -2x - 2y = 19$$
$$x + 2y = -25 \qquad\quad x + 2y = -25$$

Now Add the two equations

$$-x = -7$$

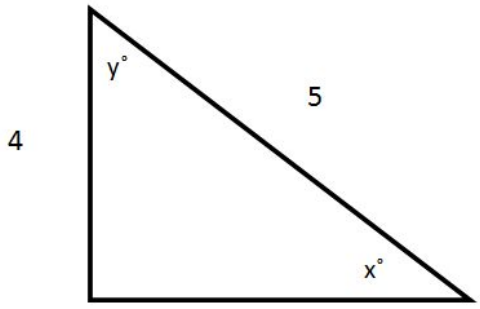
$$x = 7$$

Heart of Algebra

19

In a right triangle, one angle measures $x°$, where $\sin x° = \frac{4}{5}$. What is $\cos(90° - x°)$?

Answer: ⅘ or 0.8



Y=90-x cos(90-x)= cos (y) because of SOH CAH TOA we know the proportions of the lengths.

$$sinx = \frac{Opposite}{Hypotenuse}$$

$$cosx = \frac{Adjacent}{Hypotenuse}$$

20 If $a = 5\sqrt{2}$ and $2a = \sqrt{2x}$, what is the value of x ?	Answer: 100 $a = 5\sqrt{2}$ $2a = \sqrt{2x}$ $2a = 5 * 2\sqrt{2} = 10\sqrt{2} = \sqrt{2 * 100}$ X=100 Passport to Advanced Math

Additional Practice

1. If $\frac{2x-7}{5} = k$ and $k = 7$, what is the value of x? A) 84 B) 24 C) 42 D) 21 Answer: D	2. for $i = \sqrt{-1}$, what is the sum of $(7 - 2i) - (2 + 3i)$? A) $9 - 5i$ B) $9 + i$ C) $5 - 5i$ D) $5 + i$ Answer: C

3.

Last Tuesday, Alex sent $2m$ text messages per hour for 4 hours and Evan sent $3t$ text messages per hour for 5 hours. If Pedro sends double the text messages per hour as both Alex and Evan combined, how many texts does Pedro send in 3 hours?

A) $3m + 4.5t$
B) $6m + 9t$
C) $4m + 6t$
D) $12m + 18t$

Answer: D

4.

Nicole repairs laptops for an electronics company. Each week she is assigned a certain amount of laptops that need to be repaired. The number of laptops she has left to fix at the end of each day can be estimated with the equation L=24-6d, where L is the number of laptops left and d is the number of days she has worked that week. If Nicole has worked 1 day, how many laptops has she fixed by the end of the day?

A) 6 laptops
B) 24 laptops
C) 12 laptops
D) 18 laptops

Answer: A

5.

$(2xy^2 + zx^3 - 8zx^2) - (-2zx^3 + 3xy^2 - 2z4x^2)$

Which of the following is equal to the expression above?

A) $5xy^2 - zx^3 - 16zx^2$
B) $-xy^2 - zx^3 - 16zx^2$
C) $-xy^2 + 3zx^3$
D) $xy^2 - 3zx^3$

Answer: C

6.

$$h(t) = 3t + 20$$

A pediatrician uses the above equation to model the average growth of newborn girls from the time they're born to the age of 3. If the variable t represents 6 months, how tall is the average girl when she is 2 years old?

A) 26 inches
B) 29 inches
C) 35 inches
D) 32 inches

Answer: D

7.

$$j = \frac{\left(\frac{2x}{3y-200}\right)\left(\frac{3y}{4x}\right)^{2x}}{\left(\frac{y}{1200}\right)^{y-1}\left(\frac{2x}{15}\right)^{x}} z$$

The above equation is completely made up And represents absolutely nothing. Which of the following gives z in terms of j, x, and y?

A) $z = \frac{\left(\frac{y}{1200}\right)^{y-1}\left(\frac{3y}{4x}\right)^{2x}}{\left(\frac{2x}{3y-200}\right)\left(\frac{2x}{15}\right)^{x}} j$

B) $z = \frac{\left(\frac{y}{1200}\right)^{y-1}\left(\frac{2x}{15}\right)^{x}}{\left(\frac{2x}{3y-200}\right)\left(\frac{3y}{4x}\right)^{2x}} j$

C) $z = \frac{\left(\frac{y}{1200}\right)^{y-1}}{\left(\frac{2x}{15}\right)^{x}\left(\frac{2x}{3y-200}\right)\left(\frac{3y}{4x}\right)^{2x}} j$

D) $z = \frac{\left(\frac{2x}{15}\right)^{x}}{\left(\frac{y}{1200}\right)^{y-1}\left(\frac{2x}{3y-200}\right)\left(\frac{3y}{4x}\right)^{2x}} j$

Answer: B

8.

If $\frac{x}{y} = 12$, what is the value of $\frac{1}{x} + \frac{1}{y}$

A) 13/12
B) 1/13
C) 2/13
D) 13/24

Answer: A

9.

$4x - 3y = -4$
$y + 2x = 8$

What is the solution (x,y) to the system of equations above?

A) (4,-2)
B) (1,-2)
C) (2,4)
D) (3,4)

Answer: C

10.

$$g(x) = b\,x^4 + 16$$

For the function g defined above, a is a constant and g(2) = 48. What is the value of g(-2) ?

A) 48
B) -4
C) 0
D) -48

Answer: A

11.

$$a = 4.25 + 2x$$
$$p = 1.05 + 12x$$

In the equations above, a and p represent the price per pound, in dollars, of apples and pears, respectively, x weeks after August 1 during last summer. What was the price per pound of apples when it was equal to the price per pound of pears?

A) $59.75
B) $68.25
C) $32.00
D) $36.25

Answer: B

12.

A line in the xy-plane passes through the origin and has a slope of 3/4. Which of the following points lies on the line?

A) (0,3)
B) (6,4)
C) (8,6)
D) (8,3)

Answer: C

13.

If $x > 4$, which of the following is equivalent to: $\dfrac{1}{\frac{1}{x+2}+\frac{1}{x+5}}$

A) $\frac{x^2+7x+10}{2x+7}$

B) $\frac{1}{x^2+7x+10}$

C) $\frac{2x+7}{x^2+7x+10}$

D) $x^2 + 7x + 10$

Answer: A

14.

If $2x - y = 14$, what is the value of $\frac{9^x}{3^y}$?

A) 3^{14}
B) 3^7
C) 3
D) 3^{28}

Answer: D

15.

If $(ax + 3)(bx + 6) = 6x^2 + cx + 18$ for all values of x, and $a + b = 5$, what are the two possible values for c?

A) 21,24
B) 18,20
C) 25,27
D) The answer cannot be determined

Answer: A

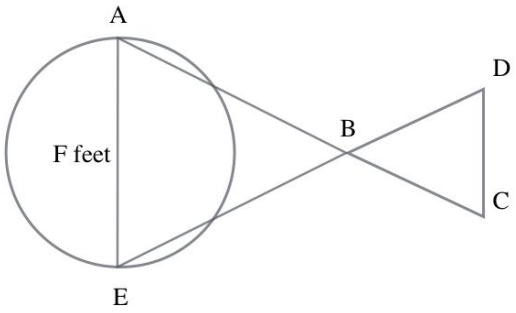
16.

If $t < 0$, and if $2t^2 - 2 = 16$, what is the value of t?

Answer: -3

17.

The circle represented above has a diameter with a length of F feet. The lengths represented by AB, EB, BD, and CD on the sketch were determined to be 24 feet, 18 feet, 9 feet, and 15 feet, respectively. Segments AC and DE intersect at B, and ∠AEB and ∠CDB have the same measure. What is the value of F?



Answer: 30

18.

$$3y - 5x = 4$$
$$y + 3x = 6$$

According to the system of equations above, what is the value of x?

Answer: 1

19.

In a right triangle, one angle measures x^o, where $\cos(x^o) = \frac{5}{13}$. what is the $\sin(x^o)$?

Answer: $\frac{12}{13}$

20.

If $b = 2\sqrt{3}$ and $2b = \sqrt{3}x$, what is the value of x?

Answer: 16