Math without Calculator: Question 1

1 Tony spends $80 per month on public transportation. A 10-ride pass costs $12.50, and a single-ride pass costs $1.50. If g represents the number of 10-ride passes Tony buys in a month and t represents the number of single-ride passes Tony buys in a month, which of the following equations best represents the relationship between g and t?

View Answer

A. $g+t=80$

B. $g+t=1.50+12.50$

C. $1.50g+12.50t=80$

D. $12.50g+1.50t=80$

2 $T=1{,}000+18h$

In the equation above, T represents Brittany's total take-home pay, in dollars, for her first week of work, where h represents the number of hours she worked that week and 1,000 represents a sign-on bonus. If Brittany's total take-home pay was $1,576, for how many hours was Brittany paid for her first week of work?

View Answer

A. 16

B. 32

C. 55

D. 88

Question Difficulty: Medium

3 A clothing store is having a sale on shirts and pants. During the sale, the cost of each shirt is $15 and the cost of each pair of pants is $25. Geoff can spend at most $120 at the store. If Geoff buys s shirts and p pairs of pants, which of the following must be true?

View Answer

A. $15s+25p \leq 120$

B. $15s+25p \geq 120$

C. $25s+15p \leq 120$

D. $25s+15p \geq 120$

Question Difficulty: Medium

4 What is the solution to $-3(x-5)=-2x+4$?

$-3x+15=-2x+4$

$-x=-11$

$x=11$

View Answer

A. 11

B. $\frac{19}{5}$

C. −9

D. −19

Question Difficulty: Medium

5 $f(x)=x^3+3x^2-6x-1$

For the function f defined above, what is the value of $f(-1)$?

$(-1)^3+3(-1)^2-6(-1)-1$

$-1+3+6-1$

View Answer

A. −11

B. −7

C. 7

D. 11

Question Difficulty: Medium

6 Triangle ABC and triangle DEF are similar triangles, where $\overline{AB}$ and $\overline{DE}$ are corresponding sides. If $DE=2AB$ and the perimeter of triangle ABC is 20, what is the perimeter of triangle DEF?

bigger ↑ small ↓

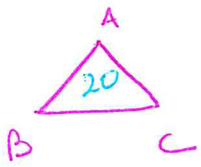
View Answer

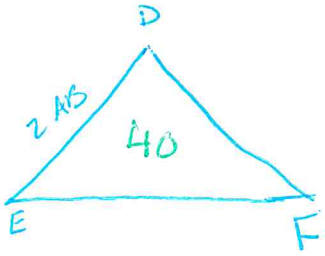
A. 10

B. 40

C. 80

D. 120





trick: ratio of perimeter of similar triangles is the same as ratio of sides

Question Difficulty: Medium

7 There were no jackrabbits in Australia before 1788 when 24 jackrabbits were introduced. By 1920 the population of jackrabbits had reached 10 billion. If the population had grown exponentially, this would correspond to a 16.2% increase, on average, in the population each year. Which of the following functions best models the population $p(t)$ of jackrabbits t years after 1788?

View Answer

A. $p(t) = 1.162(24)^t$

B. $p(t) = 24(2)^{1.162t}$ pop. is not doubling

C. $p(t) = 24(1.162)^t$ ab^x $b = 1 + r$ (%) $= 1 + 0.162 = 1.162$

D. $p(t) = (24, \cdot, 1.162)^t$ incorrect format

Question Difficulty: Medium

8 Which of the following is equivalent to the sum of $3x^4 + 2x^3$ and $4x^4 + 7x^3$?

like terms

View Answer

A. $16x^{14}$

B. $7x^8 + 9x^6$

C. $12x^4 + 14x^3$

D. $7x^4 + 9x^3$

Question Difficulty: Medium

9 The function f is defined by $f(x) = x^2$, and the function g is defined by $g(x) = x^2 + 3$. Which of the following translations of the graph of f in the xy-plane results in the graph of g? up 3, $x^2 + k$

View Answer

A. A translation 3 units downward

B. A translation 3 units upward

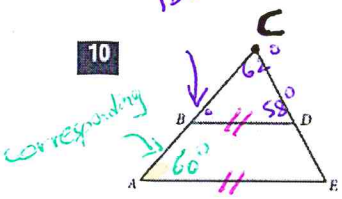
C. A translation 3 units to the left

D. A translation 3 units to the right

Question Difficulty: Medium

$180° - (62+58) = 180-120 = 60°$

10



corresponding ∠s

Note: Figure not drawn to scale.

In the figure above, segments *AE* and *BD* are parallel. If angle *BDC* measures 58° and angle *ACE* measures 62°, what is the measure of angle *CAE*?

View Answer

A. 58°

B. 60°

C. 62°

D. 120°

11 An oceanographer uses the equation $s = \frac{3}{2}p$ to model the speed *s*, in knots, of an ocean wave, where *p* represents the period of the wave, in seconds. Which of the following represents the period of the wave in terms of the speed of the wave?

View Answer

A. $p = \frac{2}{3}s$

B. $p = \frac{3}{2}s$ same as given

C. $p = \frac{2}{3} + s$

D. $p = \frac{3}{2} + s$

$2s = \left(\frac{3}{2}p\right)2$ multiply by 2

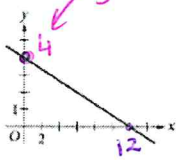
$\frac{2s}{3} = \frac{3p}{3}$

$p = \frac{2}{3}s$

KCF

trick $p = \frac{s}{\frac{3}{2}} = \frac{2s}{3}$

12



y-int

Which of the following could be an equation for the graph shown in the *xy*-plane above?

View Answer

slope = difference of y / difference of x = 4/12 = -1/3

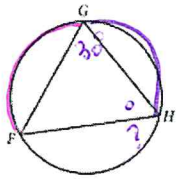
A. $y = -\frac{2}{3}x + 8$

B. $y = -\frac{3}{2}x + 4$

C. $y = -\frac{1}{3}x + 4$

D. $y = -\frac{4}{3}x + 8$

13



Note: Figure not drawn to scale.

Triangle *FGH* is inscribed in the circle above. If arc $\overset{\frown}{FG}$ is congruent to arc $\overset{\frown}{GH}$, and the measure of $\angle G$ is $30°$, what is the measure of $\angle H$?

congruent arcs means congruent cords (what hols the arc)

GF = GH

isoceles △ GHF

base angles are equal

View Answer

A. 30°

B. 60°

C. 75°

D. 120°

180 - 30 = 150

150/2 = 75

$a^2+2ab+b^2=(a+b)^2$

$(x+4)^2$

14 Which of the following is equivalent to $\sqrt[4]{x^2+8x+16}$, where $x>0$?

special case

Same as

View Answer

A. $(x+4)^4$ — A 4th root cannot be power of 4

B. $(x+4)^2$ — Factor inside $(x+4)^2$

C. $(x+4)$ — $\sqrt[4]{(x+4)^2}=(x+4)^{2/4}=(x+4)^{1/2}$

D. $(x+4)^{\frac{1}{2}}$

Question Difficulty: Medium

15 $ax+by=b$ → $by=-ax+b$, $y=-\frac{a}{b}x+1$ ← y-int → eliminate B

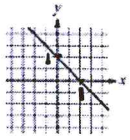
In the equation above, a and b are constants and $0<a<b$. Which of the following could represent the graph of the equation in the xy-plane?

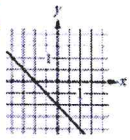
This means a and b are both greater than 0 (positive) but a is smaller than b

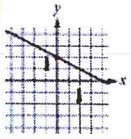
$\frac{a}{b}<1$

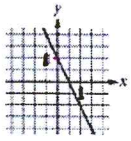
$\frac{\text{Rise}}{\text{Run}}<1$

View Answer

A.  $\frac{\text{Rise}}{\text{Run}}=\frac{1}{1}$

B. 

C.  $\frac{\text{Rise}}{\text{Run}}=\frac{1}{2}$

D.  $\frac{\text{Rise}}{\text{Run}}=\frac{1}{\frac{1}{2}}$

Hard.

16 $x+x=9$

What value of x satisfies the equation given?

solution

$2x=9$

$x=9/2=4.5$

View Answer

Question Difficulty: Easy

$x=3$ excluded value

17 $\dfrac{11x-33}{x-3}=x$

What is the solution to the equation above?

$11x-33 = x(x-3)$
$11x-33 = x^2-3x$
$0 = x^2-14x+33$

33
-11 -3
-14

$x=11$
$x=3$

View Answer

Question Difficulty: Hard

18 $2x+3y=31$
$3x-y=30$

$2x+3y=31$
$9x-3y=90$
$11x=121$

$x=11$

$2(11)+3y=31$
$3y=31-22=9$, $y=3$

If (x,y) is the solution to the system of equations above, what is the value of $100x+40y$?

$100(11)+40(3)$
$1100+120$
1220

View Answer

Question Difficulty: Hard

19 If $t>0$ and $(3t)^2-5(3t)-14=0$, what is the value of t?

$x^2-5x-14=0$

trick → substitute $3t$ with x

-14
2 -7
-5

$x=-2$ go back to $3t$ $3t=-2$ $t=-\frac{2}{3}$

$x=+7$ $3t=7$ $t=7/3$

t has to be ⊕

Note if u distribute then use the quadratic formula (too long and hard without calc) you get $t=2.33$ as a second solution.

View Answer

Question Difficulty: Hard

20 $h(x)=x^3+ax^2+bx+c$

The function h is defined above, where a, b, and c are integer constants. If the zeros of the function are -5, 6, and 7, what is the value of c?

write factored form

$(x+5)(x-6)(x-7)$

$5(-6)(-7)$ will give us the constant
$+(30)(7)$
210

View Answer

Question Difficulty: Hard