Name: Key

Math 2 NCFE Practice: Quadratics and Solving Equations
(Units 2 and 3)

A 1. Simplify: $8\sqrt{20}$

(A.) $16\sqrt{5}$ B. $32\sqrt{5}$ C. 160 D. $20\sqrt{8}$

$8\sqrt{20}$ → $8 \cdot 2\sqrt{5}$ → $16\sqrt{5}$ (5 = 4 + 1, $\sqrt{4} = 2$)

A 2. In a direct relation, if y increases, what happens to x?

(A.) Increases B. Decreases
C. Remains constant D. Not enough information to determine

D 3. Simplify $(2x-3)^2$.

$(2x-3)(2x-3)$
$2x^2-6x-6x+9$
$2x^2-12x+9$

A. $2x^2-9$ B. $4x^2+9$
C. $2x^2-6x-9$ (D.) $4x^2-12x+9$

B 4. The equation $2x^2 - 5x = -12$ is rewritten in the form of $2(x-p)^2+q=0$. What is the value of q?

$+12 \quad +12$
$2x^2-5x+12=0$

A. $\frac{167}{16}$ (B.) $\frac{71}{8} = 8.875$ C. $\frac{25}{8}$ D. $\frac{25}{16}$

Graph and look at the vertex: (1.25, 8.875)
So vertex form of the equation is $2(x-1.25)^2+8.875$

A 5. Write $2x^3 + 0x^2 - 72x$ in factored form.

(A.) $2x(x+6)(x-6)$ C. $2x(x-6)(x-6)$
B. $6x(x-6)(x+2)$ D. $-6x(x+2)(x+6)$

5) $2x^3+0x^2-72x$
$\div 2x \quad \div 2x \quad \div 2x$
$1x^2+0x-36$

-36: $6, -6$; $6 + (-6) = 0$

	x	6
x	$1x^2$	$6x$
-6	$-6x$	-36

$2x(x+6)(x-6)$

D 6. Carter is solving this equation by factoring: $10x^2 - 25x + 15 = 0$. Which expressions could be one of his correct factors?

A. $x+3$ C. $2x+3$
B. $x-3$ (D.) $2x-3$

6) $10x^2-25x+15$
$\div 5 \quad \div 5 \quad \div 5$
$2x^2-5x+3$

3: $-2, -3$; $-2 + (-5) = -5$

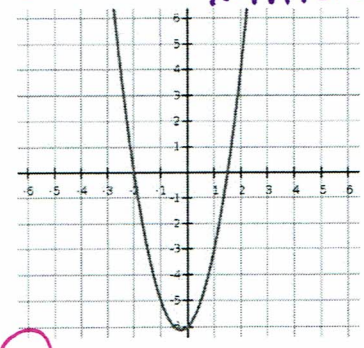
	$2x$	-3
x	$2x^2$	$-3x$
-1	$-2x$	3

$5(2x-3)(x-1)$

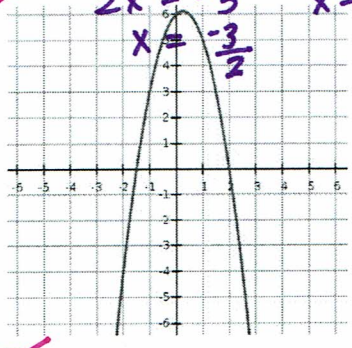
B 7. Which graph displays the function $f(x) = (2x+3)(x-2)$?

The ()'s give you the x-intercepts: $2x+3=0$, $2x=-3$, $x=\frac{-3}{2}$; $x-2=0$, $x=2$

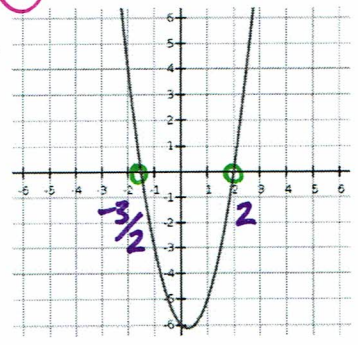
A.



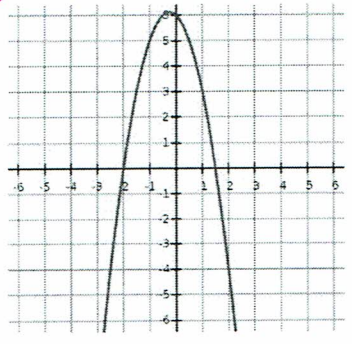
C.



(B.)



D.



Eliminate C and D, because the equation does not have a negative x^2.

A 8. Which equation has exactly one real solution?

(A.) $4x^2 - 12x - 9 = 0$ only crosses the x-axis once

B. $4x^2 + 12x + 9 = 0$

C. $4x^2 - 6x - 9 = 0$

D. $4x^2 + 6x + 9 = 0$

D 9. What are the solutions to the equation, $4x^2 = 36$?

A. x = 6, -6 B. x = 2, -2 C. x = 9, -9 (D.) x = 3, -3

$4x^2 = 36$

$\sqrt{x^2} = \sqrt{9}$

$x = 3$ or -3

B 10. Given the quadratic function, $f(x) = 2x^2 + 3x - 2$, what are the zeros?

A. $-\frac{1}{2}, 2$ C. $\frac{1}{2}, 2$

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

$\frac{-3 \pm \sqrt{(3)^2 - 4(2)(-2)}}{2(2)}$

$\frac{-3 \pm \sqrt{25}}{4} = \frac{-3 \pm 5}{4}$

$\frac{-3+5}{4} = \frac{2}{4} = \frac{1}{2}$

$\frac{-3-5}{4} = \frac{-8}{4} = -2$

D 11. The solution to the quadratic equation $2x^2 + 5x - 1 = 0$ is:

A. $\frac{5 \pm \sqrt{17}}{4}$ C. $\frac{-5 \pm \sqrt{17}}{4}$

B. $\frac{5 \pm \sqrt{33}}{4}$ (D.) $\frac{-5 \pm \sqrt{33}}{4}$

$\frac{-5 \pm \sqrt{(5)^2 - 4(2)(-1)}}{2(2)}$

$\frac{-5 \pm \sqrt{33}}{4}$

D 12. What are the solutions to the quadratic equation, $y = x^2 + 3x + 3$?

A. $x = \frac{3 \pm \sqrt{3}}{2}$ B. $x = \frac{-3 \pm i\sqrt{3}}{2}$

C. $x = \frac{-3i \pm \sqrt{3}}{2}$ (D.) $x = \frac{3 \pm i\sqrt{3}}{2}$

$\frac{-3 \pm \sqrt{(3)^2 - 4(1)(3)}}{2(1)}$

$\frac{-3 \pm \sqrt{-03}}{2} = \frac{-3 \pm i\sqrt{3}}{2}$

D 13. The number of bacteria in a culture can be modeled by the function $N(t) = 28x^2 - 30x + 160$, where t is the temperature, in degrees Celsius, at which the culture is being kept. A scientist wants to have fewer than 200 bacteria in a culture in order to test a medicine effectively. What is the ***approximate*** domain of temperatures that will keep the number of bacteria under 200?

A. $-1.01°C < t < 2.03°C$

B. $-0.90°C < t < 1.97°C$

C. $-0.86°C < t < 1.93°C$

(D.) $-0.77°C < t < 1.85°C$

When is the # of bacteria equal to 200?

Solve: $28x^2 - 30x + 160 = 200$

$-200 \quad -200$

$28x^2 - 30x - 40 = 0$

$\frac{-(-30) \pm \sqrt{(-30)^2 - 4(28)(-40)}}{2(28)} = \frac{30 \pm \sqrt{5380}}{56}$

$\frac{30 + \sqrt{5380}}{56} = 1.85$

$\frac{30 - \sqrt{5380}}{56} = -0.7$

A 14. The graph of $f(x) = x^2$ will be translated 5 units up and 2 units to the right. Which function describes the graph produced by the translation?

(A.) $g(x) = x^2 - 4x + 9$ C. $g(x) = x^2 - 10x + 27$

B. $g(x) = x^2 + 4x - 1$ D. $g(x) = x^2 + 10x + 23$

$(x-2)^2 + 5$

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

$x^2 - 2x - 2x + 4 + 5$

$x^2 - 4x + 9$

C 15. The time required to empty a tank varies inversely as the rate (in gallons per minute). If a pump can empty a tank in 3 hours at a rate of 420 gal/min, how long will it take to empty a tank at 500 gal/min?

A. 3.6 hours B. 4.2 hours
C. 2.52 hours D. 2.1 hours

Inverse variation: $y = \frac{k}{x}$

Plug in data: $3 = \frac{k}{420}$

$1260 = k$

Now, answer the question:

$y = \frac{k}{x}$

$y = \frac{1260}{500}$

$y = 2.52$

B 16. Solve the equation: $2\sqrt{x+5} - 3 = 9$

A. $x = 4$ B. $x = 31$
C. $x = 67$ D. $x = 139$

$+3 \quad +3$

$\frac{2\sqrt{x+5}}{2} = \frac{12}{2}$

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

$x + 5 = 36$

$-5 \quad -5$

$x = 31$

C 17. Solve the equation $\frac{x}{2} = \frac{x-3}{5}$

A. $x = -1$ B. $x = 1$
C. $x = -2$ D. $x = 2$

$5x = 2(x-3)$

$5x = 2x - 6$

$3x = -6 \rightarrow x = -2$

A 18. Solve the equation $\sqrt{-5x+6} = x$

A. $x = 1$ B. $x = -2$
C. $x = 1$ *and* 6 D. $x = -2$ *and* -3

$(\sqrt{-5x+6})^2 = (x)^2$

$-5x + 6 = x^2$

$-x^2 \quad -x^2$

$-x^2 - 5x + 6 = 0$

$\frac{-(-5) \pm \sqrt{(-5)^2 - 4(-1)(6)}}{2(-1)}$

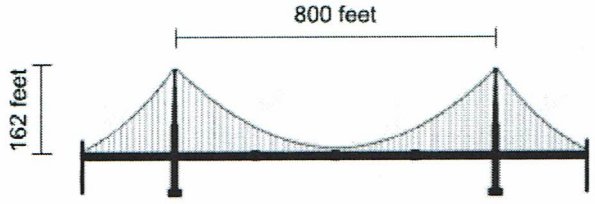
$\frac{5 \pm \sqrt{49}}{-2} = \frac{5 \pm 7}{-2}$

$\frac{5+7}{-2} = -6$

$\frac{5-7}{-2} = 1$

When you plug these answers back in, -6 is extraneous, but 1 works.

D 19. The towers of a suspension bridge are 800 feet apart and rise 162 feet higher than the road. Suppose that the cable between the towers has the shape of a parabola and is 2 feet higher than the road at the point halfway between the towers.



What is the ***approximate*** height of the cable 120 feet from either tower?

A. 80 feet B. 74 feet C. 22 feet D. 16 feet

Free response:

20. The amount of time it takes to build a road varies inversely with the number of workers building the road. Suppose it takes 50 workers 8 months to build the road.

- What is the constant of variation?
- Write an equation that could be used to determine how long it would take n workers to build the road. (Be sure to define the variables.)
- How much faster would 60 workers build the road than 50 workers?

what is k?

$y = \frac{k}{x}$

$8 = \frac{k}{50}$

$400 = k$

$y = \frac{400}{n}$, where y is time in months and n is the number of workers.

$y = \frac{k}{x}$

$y = \frac{400}{60}$

$y = 6.\overline{6}$ months

$y = \frac{k}{x}$

$y = \frac{400}{50}$

$y = 8$ months

60 workers would build the road $1.\overline{3}$ months faster than 50 workers ($1\frac{1}{3}$ months faster).