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7.4 Notetaking with Vocabulary

Success Criteria
I can use the Zero-Product Property.
I can solve polynomial equations by factoring and using the Zero Product Property.

Write the meaning of each vocabulary term.

factored form – when a polynomial is written as a product of factors

Examples:	Standard Form	Factored Form
	x^2+2x	$x(x+2)$
	$x^2+5x-24$	$(x-3)(x+8)$

To solve a polynomial equation – make one side $=0$ and the other side a product. Then use

Zero-Product Property

Words If the product of two real numbers is zero, then at least one of the numbers is zero. $5 \cdot 0 = 0$

Algebra If a and b are real numbers and $a \cdot b = 0$ then $a=0$ or $b=0$

$$\underbrace{(x-3)}_{a}\cdot\underbrace{(x+8)}_{b} \underbrace{=0}_{=0}$$

$x-3=0$ $\boxed{x=3}$ $x+8=0$ $\boxed{x=-8}$ This equation has 2 solutions/2 roots.

roots – another name for the solutions of a polynomial equation.
(numbers that make the statement true)

repeated roots – when 2 or more solutions of an equation are the same number.

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In Exercises 1–9, solve the equation. Check your solutions.

1. $x(x + 5) = 0$

$\boxed{x = 0}$ or $x + 5 = 0$

$\boxed{x = -5}$

Check: $x = 0$ $0(5) \stackrel{?}{=} 0$ $0 = 0$ ✓

$-5(-5+5) \stackrel{?}{=} 0$

$-5(0) = 0$

$0 = 0$ ✓

2. $5p(p - 2) = 0$

$5p = 0$ $p - 2 = 0$

$\boxed{p = 0}$ $\boxed{p = 2}$

3. $(c - 2)(c + 1) = 0$

$c - 2 = 0$ or $c + 1 = 0$

$\boxed{c = 2}$ $\boxed{c = -1}$

4. $(2b - 6)(3b + 18) = 0$

$2b - 6 = 0$ or $3b + 18 = 0$

$2b = 6$ $3b = -18$

$\boxed{b = 3}$ $\boxed{b = -6}$

5. $(x - 3)^2 = 0$

$(x-3)(x-3) = 0$

$x - 3 = 0$

$\boxed{x = 3}$ repeated root

6. $(2t + 8)(2t - 8) = 0$

$2t + 8 = 0$ $2t - 8 = 0$

$2t = -8$ $2t = 8$

$\boxed{t = -4}$ $\boxed{t = 4}$

7. $(w + 4)^2(w + 1) = 0$

$w + 4 = 0$ $w + 1 = 0$

$\boxed{w = -4}$ $\boxed{w = 1}$

repeated root

8. $g(6 - 3g)(6 + 3g) = 0$

$\boxed{g = 0}$ $6 - 3g = 0$ $6 + 3g = 0$

$-3g = -6$ $3g = -6$

$\boxed{g = 2}$ $\boxed{g = -2}$

9. $(4 - m)\left(8 + \frac{2}{3}m\right)(-2 - 3m) = 0$

$4 - m = 0$ or $8 + \frac{2}{3}m = 0$ or $-2 - 3m = 0$

$-m = -4$ $\cancel{\frac{3}{2}} \cdot \frac{\cancel{2}}{\cancel{3}}m = \cancel{-8}^{-4} \cdot \frac{3}{\cancel{2}_1}$ $-3m = 2$

$\boxed{m = 4}$ $\boxed{m = -12}$ $\boxed{m = \frac{-2}{3}}$

end Day 1 : pg. 381: 4, 6, 8, 10, 12, 14, 16, 18, 20, 48

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7.4 Notetaking with Vocabulary (continued)

To solve a polynomial equation using the Zero - Product Property, you need to write the polynomial as a product of other polynomials. To factor a polynomial means to write a polynomial as a product of ~~other~~ prime polynomials. There are many steps to factoring polynomials. The first step is to make sure the polynomial is in standard form. Then look for the greatest common factor (GCF). This is a monomial that divides evenly into EACH TERM.

factoring undoes distributing

24
3 · 8
3 · 2 · 4
3 · 2 · 2 · 2

We have "factored" 24

Every # can be factored into a unique product of prime #'s.

Every polynomial can be factored into a unique product of prime polynomials.

In Exercises 10–15, factor the polynomial.

10. $\frac{6x^2}{3x} + \frac{3x}{3x}$

$3x(2x+1)$

can check by distributing $6x^2+3x$ ✓

11. $\frac{4y^4}{4y^3} - \frac{20y^3}{4y^3}$

$4y^3(y^1-5)$

12. $\frac{18u^4}{6u} - \frac{6u}{6u}$

$6u(3u^3-1)$

13. $7z^7 + 2z^6$

$z^6(7z+2)$

14. $24h^3 + 8h$

$8h(3h^2+1)$

15. $15f^4 - 45f$

$15f(f^3-3)$

In Exercises 16–20, solve the equation. – Put in standard form then factor. (Make sure leading term becomes +)

16. $6k^2 + k = 0$

$k(6k+1)=0$

$\boxed{k=0}$ or $6k+1=0$

$6k=-1$

$\boxed{k=\frac{-1}{6}}$

17. $35n - 49n^2 = 0$

$-49n^2+35n=0$

$-7n(7n-5)=0$

$-7n=0$ or $7n-5=0$

$\boxed{n=0}$

$7n=5$

$\boxed{n=\frac{5}{7}}$

18. $4z^2 + 52z = 0$

$4z(z+13)=0$

$4z=0$ $\quad z+13=0$

$\boxed{z=0}$ $\boxed{z=-13}$

get zero on one side

19. $6x^2 = -72x$

$6x^2 + 72x = 0$

$6x(x+12) = 0$

$6x = 0$ or $x + 12 = 0$

$x = 0$ $x = -12$

20. $7p^2 = 21p$

$7p^2 - 21p = 0$

$7p(p-3) = 0$

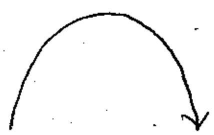
$7p = 0$ or $p - 3 = 0$

$p = 0$ $p = 3$

21. A boy kicks a ball in the air. The height y (in feet) above the ground of the ball is modeled by the equation $y = -16x^2 + 80x$, where x is the time (in seconds) since the ball was kicked. Find the roots of the equation when $y = 0$. Explain what the roots mean in this situation.

$x \rightarrow$ time (sec) input

y = height (ft)



$y = -16x^2 + 80x$

$0 = -16x^2 + 80x$

$0 = -16x(x-5)$

$-16x = 0$ $x - 5 = 0$

$x = 0$ $x = 5$

0 seconds 5 seconds

The roots mean that at 0 seconds and at 5 seconds the ball is on the ground.

Do you remember how to find the x- and y- intercepts of a line?

y-int. let $x = 0$ to find x int., let $y = 0$.

(roots/solutions of an equation = x-intercepts of a graph)

7.4 Day 2 pg. 381: 22-36 evens, 40, 42, 49-52