Math Challenge I-C: Topics in Algebra

Answer Key

Areteem Institute

Chapter 1. Polynomials and Factoring

Quick Reponse Questions:

1.11: 4

1.12: 3

1.13: 3

1.14: 5

1.15: C

1.16: A

1.17: D

1.18: 0.67

1.19: Yes.

1.20: 2

Practice Questions:

1.21(a): $3x^2 + 12x^3$

1.21(b): $15x^2y^4 + 30xy^4 + 45y^5$

1.22(a): $4x^2 + 14x - 8$

1.22(b): $-x^2 - xy + 12y^2$

1.23(a): $(x+2)(x+6)$

1.23(b): $3(x-2)(x-3)$

1.24(a): $x = -3$ or $x = 5$

1.24(b): $x = -4$ or $x = 2$

1.25(a): $x = -8$ or $x = 5$

1.25(b): $y = 1$ or $y = 11$

1.26: 2

1.27(a): $40x^3 + 80x - 40$

1.27(b): $2y^5 + 11y^3 - 4y^2 + 15y - 12$

1.28: $x = -10$, $x = 0$, or $x = 3$

1.29: 32

1.30: 17

Chapter 2. Factoring Patterns

Quick Reponse Questions:

2.11: -4

2.12: C

2.13: 10

2.14: No.

2.15: B

2.16: 2

2.17: 6

2.18: C

2.19: D

2.20: B

Practice Questions:

2.21(a): $x^2 + 6x + 9$

2.21(b): $x^3 - 12x^2 + 48x - 64$

2.22: $(x + 16)(x - 16)$

2.23: $x = \dfrac{1}{4}$

2.24: $x = -7, 11$

2.25(a): Yes

2.25(b): No

2.26: $(3x + 7)(9x^2 - 21x + 49)$

2.27: $x = -\dfrac{7}{2}, \dfrac{7}{2}$

2.28: $x = -29, 21$

2.29: $(x^2 + 2)(x + 3)$

2.30: $x = -4$ or $y = 3$

Chapter 3. Quadratics In More Depth

Quick Reponse Questions:

3.11: C

3.12: B

3.13: 3

3.14: Yes

3.15: No

3.16: 20

3.17: 4

3.18: D

3.19: B

3.20: Yes

Practice Questions:

3.21(a): $x = -8, 2$

3.21(b): $x = 2, 5$

3.22: $(x+4)^2 - 48$

3.23: $x = 3 \pm \frac{\sqrt{5}}{4}$

3.24: $\pm \dfrac{\sqrt{-ac}}{a}$.

3.25(a): $x = 1 \pm \sqrt{2}$

3.25(b): $x = 2 \pm \sqrt{3}$

3.26: x-intercepts: $\pm\sqrt{3}$, y-intercept: -3, vertex: $(0, -3)$

3.27: x-intercepts: $-4 \pm \sqrt{2}$, y-intercept: 28, vertex: $(-4, -4)$

3.28: x-intercepts: $-6, 2$, y-intercept: 12, vertex: $(-2, 16)$ which is a maximum

3.29: \$4 per box gives a profit of \$12.

3.30: \$3 per box if he buys 20 boxes

Chapter 4. Prob. Solving with Quadratics

Quick Reponse Questions:

4.11: 0

4.12: 5

4.13: C

4.14: 49

4.15: 2

4.16: 1

4.17: A

4.18: B

4.19: B

4.20: -7

Practice Questions:

4.21(a): $x = -2, \dfrac{4}{3}$

4.21(b): $x = -4 \pm 2\sqrt{7}$

4.22: x-intercepts: None, y-intercept: 5, vertex: $(-2, 1)$

4.23: x-intercepts: $-4, 1$, y-intercept: -4, vertex: $(-1.5, -6.25)$

4.24: $(14, -24)$ or $(6, -56)$

4.25(a): 0

4.25(b): 2

4.26: $m = \pm 4$

4.27: $m < \dfrac{15}{4}$

4.28: 5 yards by 15 yards

4.29: 4.6 seconds

4.30: 1.6 seconds

Chapter 5. Graphing Functions

Quick Reponse Questions:

5.11: C

5.12: B

5.13: A

5.14: D

5.15: -3

5.16: A

5.17: D

5.18: B

5.19: 4

5.20: No

Practice Questions:

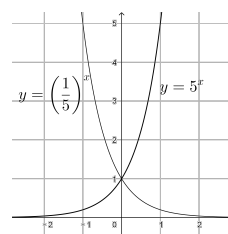**5.21:** $y = 2(x-4)^2 + 3$

5.22:
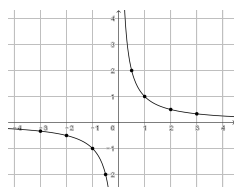
5.23:
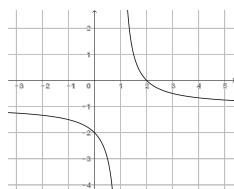
5.24: Domain: All x with $x \neq 1$, Range: All y with $y \neq -1$.

5.25: All x with $x \leq 3$
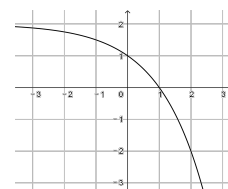
5.26:

5.27: Eventually the graph of 2^x seems to grow faster

5.28(a): $y = 2^{x-1}$

5.28(b): $y = \left(\dfrac{1}{4}\right)^x$.

5.29:

5.30: $y = \left(\dfrac{1}{2}\right)^{x-1}$.

Chapter 6. Prob. Solving with Functions

Quick Reponse Questions:

6.11: 5

6.12: -2

6.13: 4000

6.14: B

6.15: 12

6.16: D

6.17: 2

6.18: .3

6.19: No

6.20: 43

Practice Questions:

6.21(a): $\dfrac{27}{64}$

6.21(b): $2^{-5/2}$

6.22:

6.23(a): $y = 64 \times (1.5)^x$

6.23(b): 486

6.24(a): $y = 100 \times \left(\dfrac{2}{3}\right)^x$ with $C = 100, R = \dfrac{1}{3}$

6.24(b): 4

6.25: $y = 300 \times (1.02)^{4x}$ or $y \approx 300 \times (1.0824)^x$
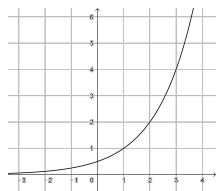
6.26: $\dfrac{1}{4}$

6.27: $x = 2$

6.28: $y = 5 \times (1+2)^x$ or $y = 5 \times 3^x$.

6.29(a): 10

6.29(b): 20% or 0.2

6.30: Possible Answer: $y - 1 = (x - 10)^2/11$

Chapter 7. Solving Equations with Square Roots

Quick Reponse Questions:

7.11: 36

7.12: 0

7.13: C

7.14: B

7.15: No

7.16: C

7.17: 14

7.18: 64

7.19: 7

7.20: 1

Practice Questions:

7.21: $x = 7 + 2\sqrt{3}$

7.22: $x = 12 + 6\sqrt{3}$

7.23: $x = 6$

7.24(a): $x = \dfrac{3}{4}$

7.24(b): $x = 2$

7.25: $x = 2$

7.26: $x = \dfrac{49}{8}$

7.27: $a = 0, \dfrac{2}{5}$

7.28: $x = 4$

7.29: They agree for all x

7.30: Domain: All x such that $0 \le x \le 8$, Range: All y such that $0 \le y \le 4$

Chapter 8. Rational Expressions

Quick Reponse Questions:

8.11: 32

8.12: 2

8.13: B

8.14: C

8.15: No.

8.16: No.

8.17: 15

8.18: -1.5
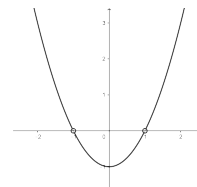
8.19: -2

8.20: D

Practice Questions:

8.21: $3x^4 + 4x^3 - 22x^2 - 32x - 16$

8.22(a): $\dfrac{x^3 - 1}{x + 1}$

8.22(b): Quotient: $x^2 - x + 1$, Remainder: -2

8.23: $t - 9$

8.24: $x^4 + x^3 + x^2 + x + 1$

8.25: $x^2 - 2x + 7 + \dfrac{-12}{x + 2}$
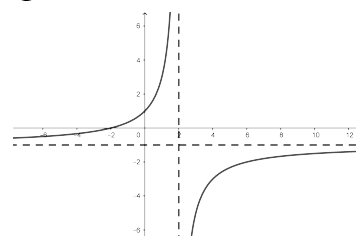
8.26: $x + 1 + \dfrac{4x + 2}{x^2 - x}$

8.27: Domain: All $x \neq -4$, Range: All $y \neq -13$.

8.28:

8.29: Vertical: $x = 2$, Horizontal: $y = -1$

8.30: Vertical: $x = 0, x = 1$, Slant: $y = x + 1$

Chapter 9. Rational Expressions and Equations

Quick Reponse Questions:

9.11: No

9.12: Yes

9.13: No

9.14: Yes

9.15: 5

9.16: 49

9.17: 3

9.18: $-.5$

9.19: .75

9.20: $-.8$

Practice Questions:

9.21: Quotient: $3x^2 - x + \dfrac{1}{3}$, Remainder: $\dfrac{25}{3}$

9.22: 0

9.23: $x = 2, x = \pm 3$

9.24: -12

9.25: 9

9.26: $\pm 1, \pm 2, \pm 3, \pm 6, \pm\dfrac{1}{2}, \pm\dfrac{3}{2}, \pm\dfrac{1}{4}, \pm\dfrac{3}{4}$

9.27: $\dfrac{x-3}{x^3+3x}$

9.28: $x = 0, x = 2 \pm \sqrt{3}$

9.29: $x = \dfrac{2}{3}$

9.30: 63