ALGEBRA I

2014-2015 SEMESTER EXAMS

PRACTICE MATERIALS KEY

SEMESTER 2

#	Question Type	Unit	Common Core State Standard(s)	DOK Level	Key
1	MC	4	N.RN.A.2	1	D
2	MC	4	F.IF.7e	2	C
3	MC	4	F.BF.3, F.IF.4	1	B
4	MTF	4	F.IF.4	1	A
5	MTF	4	F.IF.4	1	B
6	MTF	4	F.IF.4	1	A
7	MC	4	F.IF.7e	2	D
8	MTF	4	F.LE.5	1	A
9	MTF	4	F.LE.5	1	B
10	MC	4	F.BF.3	2	C
11	MC	4	F.IF.6	2	B
12	MTF	4	F.IF.8b	1	A
13	MTF	4	A.SSE.3c	1	A
14	MTF	4	A.SSE.3c	1	B
15	MC	4	F.LE.1	2	D
16	MC	4	F.LE.2	1	A
17	FR	4	N.RN.A.1, N.RE.A.2	1	-
18	CR	4	A.SSE.3	3	—
19	MC	4	F.BF.1a	2	A
20	MC	4	F.BF.2	2	B
21	TF	4	N.RN.3	1	B
22	TF	4	N.RN.3	1	A
23	CR	4	N.RN.3	3	—
24	TF	4	N.RN.3	1	B
25	CR	4	N.RN.3	2	—
26	CR	4	N.RN.2, N.RN.3	3	—
27	MC	4	N.RN.2	1	B
28	MC	4	N.RN.2	1	C
29	MC	4	N.RN.2	1	A
30	MC	4	N.RN.2	1	D
31	MC	4	N.RN.2	1	B
32	MC	4	N.RN.2	1	A
33	MC	4	N.RN.2	1	A
34	MC	4	N.RN.2	1	C
35	MC	4	N.RN.A.2	1	C
36	MC	4	N.RN.A.1	1	B
37	MC	4	A.REI.4b	2	C
38	TF	4	A.SSE.2	1	A
39	TF	4	A.SSE.2	1	A
40	MC	4	A.CED.4	2	C
41	MC	4	A.REI.4b	2	D
42	MC	4	A.REI.4b	1	A
43	MC	4	A.REI.4b	2	A
44	CR	4	A.REI.4b	2	—
45	MC	4	A.CED.1	2	D
46	MC	4	A.APR.1	1	A
47	MC	4	A.APR.1	2	A

48	MC	4	A.APR.1	1	D
49	TF	4	A.APR.1	1	A
50	TF	4	A.APR.1	1	B
51	TF	4	A.APR.1	1	A
52	CR	4	A.APR.1	2	—
53	MC	4	A.APR.1	1	D
54	MC	4	A.SSE.2	1	C
55	MC	4	A.SSE.3	2	D
56	MC	4	A.APR.1	1	C
57	MC	4	A.APR.1	1	B
58	CR	4	A.APR.1	2	—
59	CR	4	A.APR.1	2	—
60	MC	4	A.SSE.2	1	B
61	TF	4	A.SSE.2	1	A
62	TF	4	A.SSE.2	1	A
63	TF	4	A.SSE.2	1	B
64	MC	4	A.SSE.3a	2	B
65	MC	4	A.SSE.3a	2	A
66	MC	4	A.SSE.3a	2	C
67	MC	4	A.SSE.3a	2	A
68	MC	4	A.SSE.3a	2	A
69	MC	4	A.SSE.3a	2	A
70	MC	4	A.SSE.3a	2	D
71	MC	4	A.SSE.3b	1	D
72	TF	4	A.SSE.3a	2	B
73	TF	4	A.SSE.3a	2	A
74	TF	4	A.SSE.3a	2	B
75	MC	4	A.SSE.3a	1	A
76	MC	4	A.SSE.3a	2	D
77	MC	4	A.SSE.3a	1	A
78	MC	4	A.REI.4b	1	B
79	MC	4	A.REI.4b	2	B
80	MC	4	A.REI.4b	2	A
81	MC	4	A.SSE.3a	2	D
82	MC	4	A.REI.4a	2	A
83	MC	4	A.REI.4a	2	B
84	CR	4	A.REI.4b	2	—
85	MC	4	A.CED.1	2	B
86	TF	4	A.REI.4b	2	A
87	MC	4	A.REI.4b	2	A
88	MC	4	A.REI.4b	2	B
89	MC	4	A.REI.4b	2	D
90	CR	4	A.SSE.3a	2	—
91	CR	4	A.APR.1, A.SSE.1	2	—
92	MC	5	A.REI.11	2	B
93	CR	5	A.REI.4b, A.REI.3b, F.IF.8a	2	—
94	TF	4	A.REI.4b	2	B
95	MC	4	A.REI.4b	2	D
96	MC	4	A.REI.4b	2	C
97	MC	4	A.REI.4b	2	C

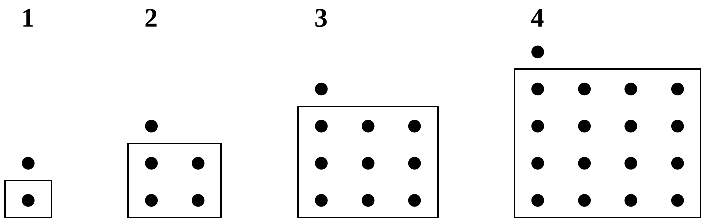
98	MC	4	A.REI.4b	2	C
99	TF	4	A.CED.1	2	A
100	TF	4	A.CED.1	2	B
101	CR	4	A.CED.1	2	—
102	CR	4	A.REI.4b, F.IF.8a	2	—
103	CR	4	A.CED.1, A.APR.1, A.REI.4b, N.Q.1	2	—
104	CR	4	F.BF.1, A.REI.4b, N.Q.1, N.Q.2, N.Q.3	2	—
105	TF	5	F.IF.4	1	A
106	TF	5	F.IF.4	1	B
107	TF	5	F.IF.5	1	B
108	MC	5	F.IF.5	2	D
109	TF	5	F.IF.8a	1	A
110	TF	5	F.IF.8a	1	A
111	TF	5	F.IF.8a	1	B
112	MC	5	F.BF.4a	1	D
113	CR	5	F.BF.1b, A.REI.4b, N.Q.3	2	—
114	MC	4	A.REI.4b	2	A
115	MC	5	F.IF.4	2	A
116	MC	5	F.IF.5	1	A
117	MC	5	F.IF.7a	1	B
118	MC	5	F.IF.7a	2	C
119	MC	5	F.IF.7a	2	B
120	MC	5	F.IF.7a	2	C
121	TF	5	F.IF.8a	1	A
122	TF	5	F.IF.8a	1	B
123	MC	5	F.IF.8a	1	B
124	MC	5	F.IF.9	2	B
125	CR	5	F.IF.7a, F.IF.8a, F.IF.4	2	—
126	MC	5	F.IF.8a	2	B
127	TF	5	F.IF.8a	2	A
128	TF	5	F.BF.3	2	B
129	MC	5	F.IF.9	2	A
130	MC	5	A.SSE.3b	1	B
131	MC	5	F.IF.8a	1	A
132	CR	5	F.IF.7a, F.IF.8a, F.IF.6	2	—
133	CR	4	F.BF.1a, F.IF.8a	2	—
134	MC	5	A.SSE.1	2	C
135	MC	5	A.SSE.1	2	B
136	MC	5	F.IF.6	1	D
137	MC	5	F.IF.7a	2	A
138	TF	5	F.BF.3	2	A
139	TF	5	F.BF.3	2	A
140	CR	5	A.SSE.3, A.REI.4b, F.IF.7a, A.REI.7	2	—
141	MC	5	A.REI.7	2	C
142	TF	5	A.REI.11	2	A
143	TF	5	A.REI.11	2	B
144	MC	5	A.REI.11	2	C

145	MC	3	S.ID.2	2	D
146	MC	3	S.ID.1	2	D
147	MC	3	S.ID.1	2	C
148	MC	3	S.ID.2	2	B
149	MC	3	S.ID.2	2	C
150	MC	3	S.ID.2	2	D
151	MC	3	S.ID.2	2	D
152	MC	3	S.ID.8	2	A
153	MC	3	S.ID.2	2	A
154	MC	3	S.ID.2	2	A
155	MC	3	S.ID.2	2	D
156	MC	3	S.ID.2	2	B
157	MC	3	S.ID.2	2	D
158	MC	3	S.ID.5	1	C
159	MC	3	S.ID.5	1	D
160	MC	3	S.ID.5	1	A
161	CR	3	S.ID.5	2	—
162	MC	3	S.ID.6a	2	C
163	MC	3	S.ID.6a	1	C
164	MC	3	S.ID.6a	2	A
165	MC	3	S.ID.6b	1	B
166	MC	3	S.ID.7	1	C
167	MC	3	S.ID.7	1	B
168	MC	3	S.ID.7	1	B
169	MC	3	S.ID.8	1	A
170	TF	3	S.ID.8	1	A
171	TF	3	S.ID.8	1	B
172	TF	3	S.ID.9	1	B
173	TF	3	S.ID.8	1	A
174	TF	3	S.ID.8	1	B
175	ER	3	S.ID.1, S.ID.2, S.ID.3, S.ID.6	3	—
176	MC	3	S.ID.6b	1	B
177	TF	5	F.LE.3	1	B
178	CR	5	A.REI.7	2	—
179	TF	5	F.LE.3	1	B
180	MC	5	S.ID.6a	2	B
181	MC	5	S.ID.6a	2	B

17. This question assesses the student's ability to solve equations using properties of integer and rational exponents, and create equivalent expressions using properties of exponents.
    (a) $x = 4$
    (b) $n = 6$
    (c) $t = 6$

18. This question assesses the student's ability to construct algebraic expressions for sequences from physical patterns and show algebraic expressions are equivalent.

(a) Mark is correct because each figure is a square of $n \times n$ dots plus one additional dot, or $n^2 + 1$.



Sofia is correct because each figure is a rectangle of $n \times (n + 1)$ minus a rectangle of $1 \times (n - 1)$, or $n(n+1)-(n-1)$
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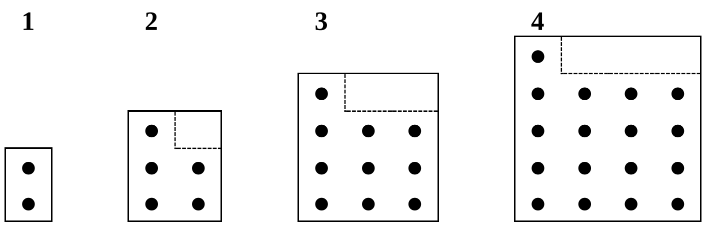

(b) Using Sofia's expression,

$n(n+1)-(n-1)$

$= n^2 + n - n + 1$

$= n^2 + 1$

which is Mark's expression.

23. This question assesses the student's understanding of the properties of real number system and its subsets, specifically rational and irrational numbers.

(a) An irrational number is a real number that cannot be expressed as the ratio of two integers.

(b) We know 2 is rational and $\sqrt{3}$ is irrational. Assume $2+\sqrt{3}=n$, where n is a rational number. Then $\sqrt{3}=n-2$. Since n and 2 are both rational, and the rational numbers are closed under subtraction, $n – 2$ is also rational. That means $\sqrt{3}$ is rational. But that contradicts what was given, that $\sqrt{3}$ is irrational. Thus, $2+\sqrt{3}$ must be irrational.

25. This question assesses the student's understanding of the properties of real number system and its subsets, specifically rational and irrational numbers.

(a) $\frac{1}{2}+\frac{1}{4}=\frac{3}{4}$. Both addends are ratios of integers, as is the sum.

(b) $2\times\sqrt{3}=\frac{2}{1}\times\sqrt{3}=\sqrt{12}$. Radicals are rational if they are perfect squares. Only one factor is rational; the product is irrational.

(c) $\sqrt{2}\times\sqrt{8}=\sqrt{16}=4$. Both factors are irrational, but the product is rational.

26. This question assesses the student's understanding of the properties of real number system and its subsets, specifically rational and irrational numbers.

(a) $\sqrt{24}=\sqrt{4}\times\sqrt{6}=2\times\sqrt{6}$

(b) $\sqrt{2}\times\sqrt{8}=\sqrt{16}=4$

(c) Let a be a rational number and b be an irrational number. Assume $a + b$, where n is a rational number. Then $b=n-a$. Since n and a are both rational, and the rational numbers are closed under subtraction, $n - a$ is also rational. That means b is rational. But that contradicts what was given, that b is irrational. Thus, $a + b$ must be irrational.

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44. This question assesses the student's ability to use solve a quadratic equation.

(a)
$$x^2-8=0$$
$$x^2=8$$
$$x=\pm\sqrt{8}$$
or
$$x=\pm 2\sqrt{2}$$

(b)
$$(x-2)^2-4=0$$
$$(x-2)^2=4$$
$$x-2=\pm 2$$
$$x=2\pm 2$$
$$x=0 \text{ or } x=4$$

(c)
$$3(x+6)^2=15$$
$$(x+6)^2=5$$
$$x+6=\pm\sqrt{5}$$
$$x=-6\pm\sqrt{5}$$

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52. This question assesses the student's understanding that polynomials are similar to systems of numbers.

(a) A polynomial is a monomial or sum of monomials. A monomial is a number, a variable, or the product of a number and one or more variables raised to whole number powers.

(b) $\left(x^2+3\right)+\left(2x+4\right)=x^2+2x+7$

(c) The product of two polynomials is the sum of all products of all monomials between the two polynomials. The coefficients of the monomials are real numbers, and since multiplication is closed for real numbers, any coefficients must also be real numbers. Since variables in monomials must be whole number powers, which are closed under addition, and when multiplying monomials the resulting exponents are the sums of the exponents in the factors, the product must have whole number powers. When like terms are added, since real numbers are closed under addition, the resulting coefficients must also be real numbers. Hence, all terms in the resulting expression meet the definition of a monomial, and the sum of them is therefore a polynomial.

58. This question assesses the student's ability to do arithmetic with polynomials.

$$2(1.2x+0.3)(x-0.5)+\left(0.5x^2+2.5x-1.3\right)$$
$$=2\left(1.2x^2-0.6x+0.3x-0.15\right)+\left(0.5x^2+2.5x-1.3\right)$$
$$=2\left(1.2x^2-0.3x-0.15\right)+\left(0.5x^2+2.5x-1.3\right)$$
$$=2.4x^2-0.6x-0.3+0.5x^2+2.5x-1.3$$
$$=2.9x^2+1.9x-2.6$$

so a = 2.9, b = 1.9, and c = –2.6

59. This question assesses the student's ability to do arithmetic with polynomials.

(a) $f(x)\cdot g(x)=(2x-3)\left(\frac{x}{3}+2\right)=\frac{2}{3}x^2+3x-6$

(b) $f(x)+h(x)=(2x-3)+\left(3x^2-x-4\right)=3x^2+x-7$

(c) $f(x)-g(x)=(2x-3)-\left(\frac{x}{3}+2\right)=\frac{5x}{3}-5$

84. This question assesses the student's ability to use solve a quadratic equation.

$$x^2-10x+25=81$$
$$(x-5)^2=81$$
$$x-5=\pm 9$$
$$x=5+9 \text{ or } x=5-9$$
$$x=14 \text{ or } x=-4$$

90. This question assesses the student's understanding of quadratic equations and the number of solutions they may have under certain circumstances.

If the quadratic has a factor of 2x – 3, then it has a zero at $x=\frac{3}{2}$.

It is NOT possible for the quadratic to have no real zeros since we know it already has one.

To have only one real zero, the other factor must be the same, so the expression is $(2x-3)^2$.

To have two real zeros, the other factor can be <u>any</u> linear expression, for example $(2x-3)(x+2)$.

91. This question assesses the student's ability to find equivalent forms of expressions.

$$\begin{aligned} f(x) &= a(x-h)^2 + k \\ &= a\left(x^2 - 2hx + h^2\right) + k \\ &= ax^2 - 2ahx + ah^2 + k \\ &= ax^2 + (-2ah)x + \left(ah^2 + k\right) \\ &= ax^2 + bx + c \end{aligned}$$

So, $b = -2ah,\ c = ah^2 + k$

93. This question assesses the student's ability to complete the square and apply the quadratic formula to a quadratic function.

(a)

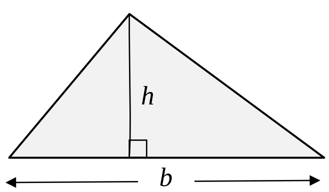
$$\begin{aligned} f(x) &= x^2 - 2x + 9 \\ &= \left(x^2 - 2x + 1\right) + 9 + 1 \\ &= (x+1)^2 + 10 \end{aligned}$$

(b)

$$\begin{aligned} x &= \frac{2 \pm \sqrt{(-2)^2 - 4(1)(9)}}{2(1)} \\ &= \frac{2 \pm \sqrt{-34}}{2} \end{aligned}$$

Because the discriminant is negative, there are no real zeros for this quadratic.

101. This question assesses the student's ability to use polynomial arithmetic and solve equations in applied situation.



(a) Given that $b = 2h$ and $A = 25$

$$\begin{aligned} A &= \frac{1}{2}bh \\ 25 &= \frac{1}{2}(2h)h \\ 25 &= h^2 \\ \pm 5 &= h \end{aligned}$$

The negative value is extraneous here, so the base has length 10 m and the height is 5 m.

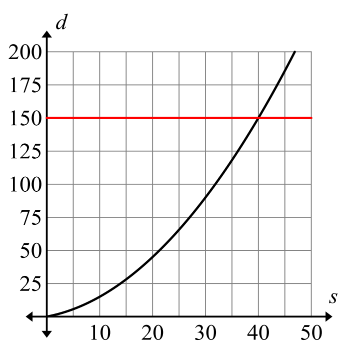
(b) Any similar triangle has a base twice the length of the height, so

$$A = \frac{1}{2}bh$$
$$A = \frac{1}{2}(2h)h$$
$$A = h^2$$

The area can be any positive number (in square feet) that is a perfect square, since h is an integer. For example, if $h = 4$ feet, then $A = 16$ square feet.

102. This question assesses the student's ability to use polynomial arithmetic and solve equations in applied situation.

Graphing $d = \frac{3(s^2 + 10s)}{40}$ and $d = 150$:

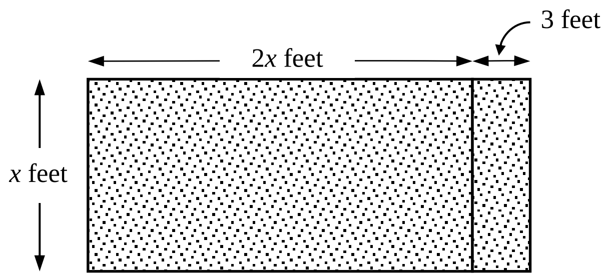


When $d = 150$ feet, $s = 40$ mph. Distances less than 150 feet correspond to speeds less than 40 mph. So, the fastest speed a car can be moving so braking distance does not exceed 150 feet is 40 miles per hour.

103. This question assesses the student's ability to create equations, apply polynomial arithmetic, solve quadratic equations, and use units in applied situations.

(a) Perimeter = $x + 2x + 3 + x + 3 + 2x = 6x + 3$ feet.

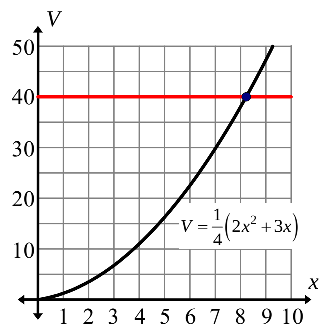
(b) Area = $(2x)(x) + (3)(x) = 2x^2 + 3x$ square feet.



(c) The volume of sand is 40 cubic feet. The sand is 3 inches deep which is ¼ of a foot. So, the volume of the pit is

$$\frac{1}{4}\left(2x^2+3x\right)=40$$
$$2x^2+3x=160$$
$$2x^2+3x-160=0$$
$$x=\frac{-3\pm\sqrt{3^2-4(2)(-160)}}{2(2)}$$
$$x=\frac{-3\pm\sqrt{1289}}{4}$$
$$x\approx 8.22$$

A graphical solution is also shown.



(d) The dimensions of the pit are about 8.22 feet by 19.45 feet.

The fence will be on the perimeter, so 6(8.22) + 3 ≈ 52.35 feet are needed.

104. . This question assesses the student's ability to create quadratic functions and use them in applied situations, and use units to make sense of problems.

(a) Let S equal the number of bushels the farmer can grow at a rate of 10000 bushels/km^2. So, on a x km by x km plot a farmer can grow $S = 10000x^2$ bushels.

(b) Let E equal the earnings made at p dollars/bushel. $E = Sp = \left(10000x^2 \text{ bushels}\right)\left(p\ \frac{\text{dollars}}{\text{bushel}}\right) = 10000px^2$ dollars

.

$$E = 960000 \text{ dollars} = \left(10000\frac{\text{bushels}}{\text{km}^2}\right)\left(15\ \frac{\text{dollars}}{\text{bushel}}\right)x^2$$
$$960000 \text{ dollars} = \left(150000\frac{\text{dollars}}{\text{km}^2}\right)x^2$$

(c) $6.4 \text{ km}^2 = x^2$

$$x=\sqrt{6.4}\text{ km}$$
$$x\approx 2.5\text{ km}$$

So the field is 2.5 km square.

113. This question assesses the student's ability to find solutions to quadratic functions and slopes of linear functions in the context of a system of a quadratic and a linear function.

(a) We are told the height of the cylinder is 7 times its radius, so the lateral surface can be written as $A_L = 2\pi r(7r) = 14\pi r^2$.

The surface area of the capsule is the cylinder's lateral area plus the surface area of two hemispheres.

$C(r) = 7\pi r^2 + 2(2\pi r^2) = 11\pi r^2$.

(b)

$$\begin{aligned} 11\pi r^2 &= 2.3\text{ cm}^2 \\ r^2 &= \frac{2.3\text{ cm}^2}{11\pi} \\ r &= \pm\sqrt{\frac{2.3\text{ cm}^2}{11\pi}} \\ r &\approx 0.2579\ldots\text{ cm} \end{aligned}$$

To two significant figures, $r \approx 0.26$ cm.

125. This question assesses the student's ability to find solutions to graph quadratic functions and describe characteristics of the function.

(a) There is a y-intercept when $x = 0$; $y = -2(0)^2 - 2(0) + 1 = 1$. The y-intercept is at (0, 1).

The x-intercepts occur when $y = 0$;

$$\begin{aligned} 0 &= -2x^2 - 2x + 1 \\ x &= \frac{2 \pm \sqrt{(-2)^2 - 4(-2)(+1)}}{2(-2)} \\ x &= \frac{2 \pm \sqrt{12}}{-4} \\ x &= \frac{2 \pm 2\sqrt{3}}{-4} \\ x &= -\frac{1}{2} \pm \frac{\sqrt{3}}{2} \end{aligned}$$

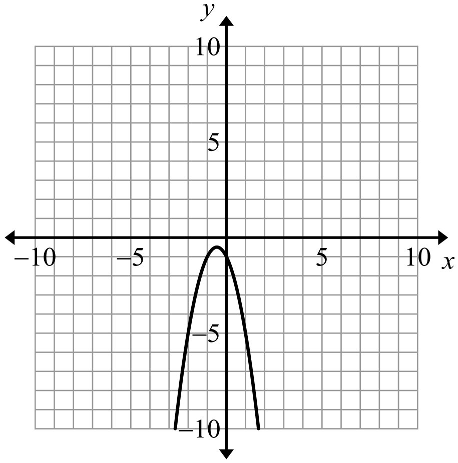
.

Since the x-intercepts at $\left(-\frac{1}{2} + \frac{\sqrt{3}}{2}, 0\right)$ and $\left(-\frac{1}{2} - \frac{\sqrt{3}}{2}, 0\right)$ or approximately (0.37, 0) and (–1.37, 0).

(b) The axis of symmetry is at $x = -\frac{b}{2a} = -\frac{-2}{2(-2)} = -\frac{1}{2}$

(c) The x-coordinate of the vertex is at $x = -\frac{b}{2a} = -\frac{-2}{2(-2)} = -\frac{1}{2}$. The y-coordinate is

$y = -2\left(-\frac{1}{2}\right)^2 - 2\left(-\frac{1}{2}\right) + 1 = -\frac{1}{2} + 1 + 1 = \frac{3}{2}$. The vertex is at $\left(-\frac{1}{2}, \frac{3}{2}\right)$.



(d)

(e) The domain is all real numbers, the range is $f(x) \le \frac{3}{2}$.

132. . This question assesses the student's ability to derive the equation of a quadratic from a graph, find its zeros, and compute the rate of change between two points.

(a) The vertex of the quadratic is at (1, 5), so the equation is of the form $y = a(x-1)^2 + 5$. The *y*-intercept at (0, 4) is a solution, so

$$\begin{aligned} 4 &= a(0-1)^2 + 5 \\ -1 &= a(1)^2 \\ -1 &= a \end{aligned}$$

. Thus, the equation of the parabola is $y = -(x-1)^2 + 5$.

(b) Its *x*-intercepts are where

$$\begin{aligned} -(x-1)^2 + 5 &= 0 \\ (x-1)^2 &= 5 \\ x-1 &= \pm\sqrt{5} \\ x &= 1 \pm \sqrt{5} \end{aligned}$$

.

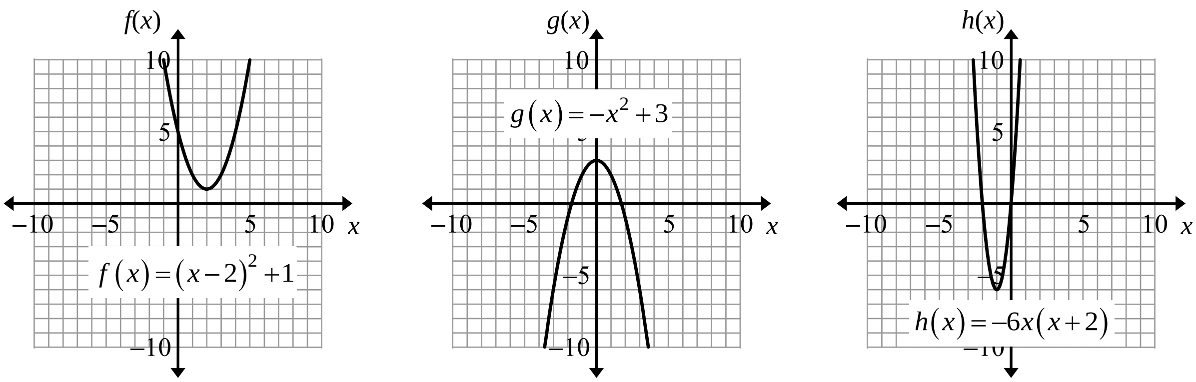
(c) The average rate of change of the function between (0, 4) and (1, 5) is $\frac{5-4}{1-0} = 1$.

133. This question assesses the student's ability to define and sketch quadratic functions with certain characteristics. Answers will vary.

(a) *f* should be of the form, or equivalent to, $f(x) = a(x-2)^2 + k$ where $a > 0$ and $k > 0$.

(b) g should be of the form, or equivalent to, $g(x) = ax^2 + bx + 3$ where $a < 0$.

(c) h should be of the form, or equivalent to, $h(x) = a(x+2)(x-r)$ where $a(r+2)^2 = 24$.

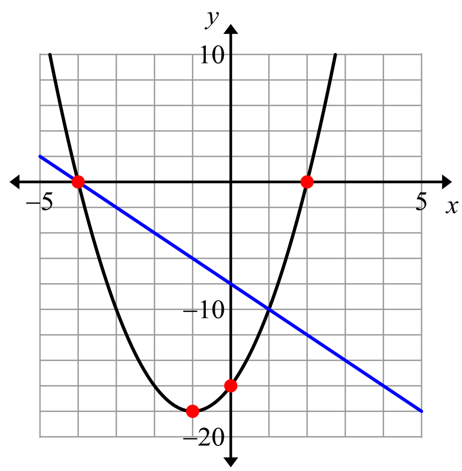


140. This question assesses the student's ability to factor, solve, and graph a quadratic function; and solve a system of a quadratic and a linear function.

(a) $2x^2 + 4x - 16 = 2(x+4)(x-2)$

(b)
$$2x^2 + 4x - 24 = 0$$
$$2(x+4)(x-2) = 0$$
$$x = -4 \text{ or } x = 2$$

(c) The key points are the x-intercepts at (–4, 0) and (2, 0), the y-intercept at (0, –16), and the vertex at (–1, –18).



(d)
$$-2x - 8 = 2x^2 + 4x - 16$$
$$0 = 2x^2 + 6x - 8$$
$$0 = 2(x+4)(x-1)$$
$$x = 1 \text{ and } x = -4$$

The solution to the system is (1, –10) and (–4, 0).

161. This question assesses the student's ability to interpret two-way tables of categorical data and look for relationships between the variables.

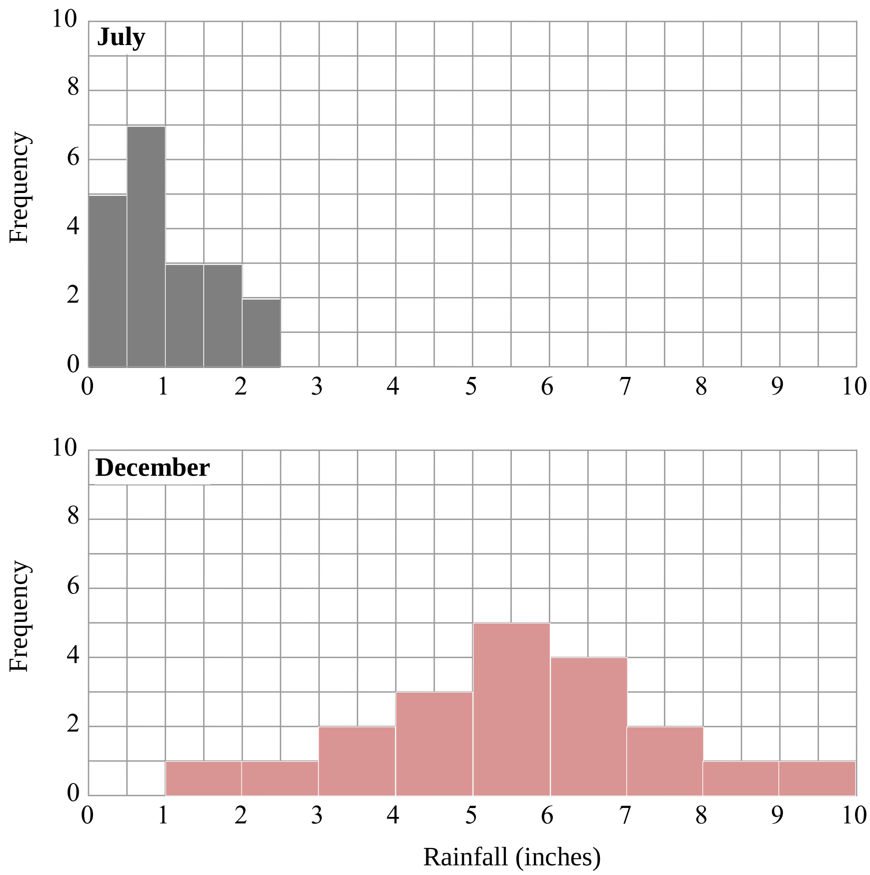
		Class			
		Freshmen	Sophomores	Juniors	Total
Favors the change	Yes	56	38	32	126
	No	24	37	58	119
	Total	80	75	90	245

(a) 126/245 ≈ 51%

(b) Freshmen: 56/80 = 70% **Highest favorability**
Sophomores: 38/75 ≈ 51%
Juniors: 32/90 ≈ 36% **Lowest favorability**

(c) There is a relationship. The older the student, the less chance he favors the change in dress code.

175. This question assesses the student's ability create graphical representations of univariate and bivariate data and describe their characteristics; compare characteristics of multiple data sets; compute measures of center and spread; and describe the effect of extreme values on statistical measures.



(a)

(b) July's distribution is skewed right. December's distribution is symmetric. (Students may choose to make the histogram using bin widths of 0.5 inches or 1.0 inches.)

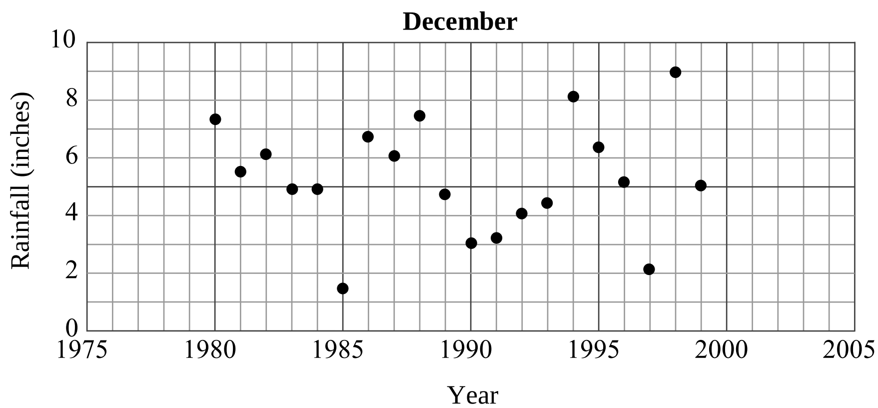
(c) Since the distribution of July rainfall is skewed right, the mean will be greater than the median.

(d) The median rainfall for December is 5.15 inches. The median rainfall for July is between 0.5 inches and 1.0 inch. The median rainfall for December is at least 4 inches greater than July.

(e) 1) Compute the mean rainfall for the 20 observations.
2) Subtract the mean from each of the 20 observations.
3) Square those values.
4) Add up those squares.
5) Divide by 19.
6) Take the square root of that value. The standard deviation will have units of inches.

(f) December's rainfall has the larger standard deviation because its distribution has a much wider spread than July's.

(g) The median is between 0.5 and 1.0 inches. Changing 2.4 to 1.4 will not affect the median because the value will remain greater than the median. Changing 2.4 to 1.4 will decrease the mean by $\frac{1.0}{20} = 0.05$ inches.



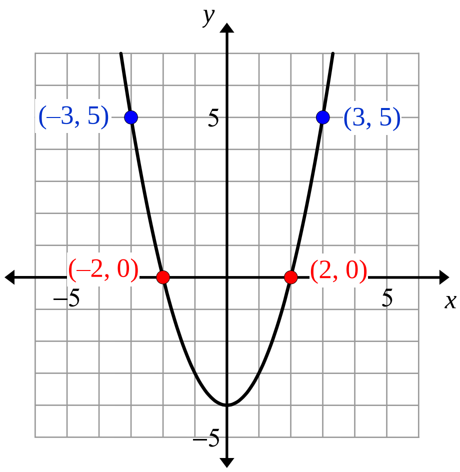
(h)

(i) There is no relationship between rainfall and year. That is, the rainfall amounts over time seem to vary randomly with no trend of increase or decrease.

178. This question assesses the student's ability to find solutions to quadratic functions and slopes of linear functions in the context of a system of a quadratic and a linear function.

The quadratic $y = x^2 - 4$ goes through (p, 0), so $0 = p^2 - 4$, thus $p = \pm 2$.

The quadratic $y = x^2 - 4$ goes through (t, 5), so $5 = t^2 - 4$, thus $t = \pm 3$.



Of the four lines that can go through (p, 0) and (t, 5), the one with the greatest slope will go through (2, 0) and (3, 5) and has a slope of 5.