

## Notes for Marking Level I Worksheets

1. It is important that students write correct intermediate steps. Remind them that doing so will help them in the longer term, and also when doing corrections.
2. In the factorisation exercises (I31–80), only a typical form of each answer is shown in this answer book, and equivalent answers should be marked correct (provided they are fully factorised). See further notes about equivalent answers on the next page.
3. From I107 on, remind students to rationalise denominators, i.e. any fraction with a radical (square root) in the denominator should be rewritten so that the radical appears in the numerator.
4. In the section on graphs of quadratic functions (I141–170), it is not necessary for each graph to be correct in every precise detail, but the graph should capture important features correctly. A graph drawn incorrectly (e.g. one with a pointed vertex rather than a curved vertex, or one which does not reach to the edges of the graph) should be marked incorrect.

## Further Notes on Equivalent Answers

A general feature of algebra is that the exact form of any answer can vary depending on the order of letters, brackets and signs. The following are some examples of equivalent answers:

Examples	Notes
$b - a$ or $-a + b$ $(3 + x)(2 + x)$ or $(x + 3)(x + 2)$ $3 - x - x^2$ or $-x^2 - x + 3$	Terms may be added in a different order. Note: it is normally recommended to write answers in alphabetic order. Answers with powers are normally written in descending order of powers.
$(2x + 4)(3x + 1)$ or $(3x + 1)(2x + 4)$ $(x - 1)(x + 1)$ or $(x + 1)(x - 1)$	Terms may be multiplied in a different order.
$\frac{1}{3}x - \frac{2}{5}y$ or $\frac{x}{3} - \frac{2y}{5}$ $\frac{3x + 1}{3}$ or $x + \frac{1}{3}$	Fractions may be written either as coefficients or as algebraic fractions.
$(4 - x)(1 + x)$ or $-(x - 4)(x + 1)$	Negative signs can appear inside or outside brackets.

## Formal Definition of Equivalent Answers

Two answers are equivalent if they give the same result no matter which values are substituted:

- $(x + 2)(x + 3)$  and  $(x + 3)(x + 2)$  **are** equivalent, e.g. substituting  $x = 10$  gives

$$\left. \begin{array}{l} (x + 2)(x + 3) = 12 \times 13 = 156 \\ (x + 3)(x + 2) = 13 \times 12 = 156 \end{array} \right\} \text{agree (also agree for other values of } x \text{)}$$

- $(x + 2)^2$  and  $x^2 + 4$  are **not** equivalent, e.g. substituting  $x = 10$  gives

$$\left. \begin{array}{l} (x + 2)^2 = (12)^2 = 144 \\ x^2 + 4 = 10^2 + 4 = 104 \end{array} \right\} \text{disagree (also disagree for most other values of } x \text{)}$$

The answers start from the next page.

# I 1-3

1		2	3
(1) $-\frac{1}{6}$		(1) $\boxed{-\frac{7}{3}}a + b$	(1) $28x^3y$
(2) $-\frac{11}{12}$		(2) $3x - 4$	(2) $-12x^3y^2$
(3) $-1\frac{2}{3}$		(3) $-\frac{1}{3}a + \frac{1}{4}b$	(3) $-16x^5y$
(4) $-1\frac{11}{30}$		(4) $5x^2 + x - 5$	(4) $3a^4b^3x$
(5) $-\frac{1}{8}$		(5) $2a - 5b + 3$	(5) $-\frac{5}{2}x^4y^5$
(6) $-33$		(6) $7x^2 + 2x$	(6) $0$
(7) $-\frac{6}{35}$		(7) $x - 5$	(7) $-30x^2y^2z^2$
(8) $-3$		(8) $x^2 - 2x - 5$	(8) $60x^2y^3z$
(9) $6$		(9) $\frac{5}{6}x + z$	(9) $60x^6y^8z^4$
1		2	3
(10) $4$	(17) $\frac{1}{8}$	(10) $4a^2$	(10) $3x^4y^4$
(11) $-8$	(18) $-9$	(11) $-8a^3$	(11) $12x^5y^6$
(12) $16$	(19) $9$	(12) $\frac{1}{4}a^2$	(12) $-\frac{8}{21}a^6x^5y^6$
(13) $\frac{1}{4}$	(20) $27$	(13) $-4a^2$	(13) $-8x^3y^6$
(14) $-\frac{1}{8}$	(21) $-\frac{1}{27}$	(14) $2a^2$	(14) $\frac{8}{27}x^6y^6$
(15) $8$	(22) $-\frac{1}{81}$	(15) $\boxed{4a^2} - 4a^3$	(15) $20x^5y^3z^2$
(16) $32$		(16) $32a^6$	(16) $32x^5y^{10}z^3$
		(17) $\boxed{4a^2} - 3a^2$	(17) $45x^4y^6z^6$
		(18) $9a^3$	(18) $64x^6y^{18}$
		(19) $\boxed{-8a^3} 9a^4$	
		(20) $-15a^5$	

4	5	6
(1) 1 (2) $-\frac{2}{3}$ (3) 2 (4) $\frac{1}{c}$ (5) $\frac{2ab}{c}$ (6) $6b^2$ (7) 1	(1) $2x-4y$ (2) $5x-y$ (3) 10 (4) $-5x+6y$ (5) $-5x-10y$ (6) $-5x+2$ (7) $-3x-6y+5$ (8) $-\frac{2}{3}x+\frac{13}{15}$ (9) $-\frac{5}{4}x+\frac{7}{4}y$	(1) $10x$ (2) $10x$ (3) $-6x+18$ (4) $7x-3$ (5) $9x-8$
4	5	6
(8) $2x^{\boxed{2}}z$ (9) $6x^4y^4$ (10) $\frac{3x^2}{2y^3}$ (11) $\frac{2}{ab^2}$ (12) $-\frac{8x^2}{3y^2}$	(10) $8x-12y$ (11) $-\frac{4}{9}x-1$ (12) $9x+10$ (13) $-3x+2y+\frac{2}{3}$ (14) $-2x+2$ (15) $8x$ (16) $-7x$ (17) $2x+6$ (18) $\frac{1}{2}x+\frac{5}{2}$	(6) $\frac{6x-8}{3}$ (7) $\frac{4x+1}{3}$ (8) $\frac{2x-3}{2}$ (9) $\frac{-x-19}{6}$ (10) $x-17$

# 17-8

7	8	
<p>(1) <math>3x^2 - 12xy</math></p> <p>(2) <math>6x^2y - 12xy^2 + 30xyz</math></p> <p>(3) <math>-12x^2y + 20xy^2</math></p> <p>(4) <math>-8x^4y^2 + 10xy^5</math></p> <p>(5) 0</p>	<p>(1) <math>-a</math></p> <p>(2) <math>\frac{b+c}{a}</math></p> <p>(3) <math>\frac{c}{a+b}</math></p> <p>(4) <math>a+b</math> 1</p> <p>(5) <math>-1</math></p>	<p>(6) <math>\frac{b}{a}</math></p> <p>(7) 1</p> <p>(8) <math>-1</math></p> <p>(9) 5</p> <p>(10) <math>-3</math></p>
7	8	
<p>(6) <math>3x - 4</math></p> <p>(7) <math>-2y + 3x</math></p> <p>(8) <math>\frac{x}{2} - \frac{3}{2} - \frac{1}{x}</math></p> <p>(9) <math>\frac{1}{2y} - \frac{1}{x} + \frac{y}{2x^2}</math></p> <p>(10) <math>-2x + y</math></p>	<p>(11) <math>b</math> <math>\frac{c}{a+b}</math></p> <p>(12) <math>c</math> <math>\frac{b}{a-c}</math></p> <p>(13) <math>b</math> <math>b</math> 4</p>	<p>(14) <math>1</math> <math>\frac{b}{a+1}</math></p> <p>(15) <math>\frac{b}{a-1}</math></p> <p>(16) 10</p>

9		10	
(1) $\boxed{+}$ -1	(4) $\boxed{+}$ -2	(1) $kx$	(4) $\frac{4a}{5}$
(2) $\boxed{-}$ $\boxed{+}$ -1	(5) -4	(2) $\boxed{bc}$ $\frac{bc}{d}$	(5) $\boxed{a}$ $\boxed{a}$ $\frac{abc}{a+b}$
(3) -1	(6) -6	(3) $\frac{ad}{c}$	(6) $\frac{ab}{-a+b}$
9		10	
(7) $\boxed{-}$ $\boxed{+}$ -3	(10) $\boxed{+}$ $\boxed{-}$ -1	(7) $\frac{2A}{h}$	(9) $\frac{c}{2r}$
(8) -7	(11) -1	(8) $\frac{2A}{b+c}$	(10) $\frac{360A}{\pi r^2}$
(9) -5	(12) -6		

# I 11-12

11	12
<p>(1) <math>ac + ad + \boxed{bc} + \boxed{bd}</math></p> <p>(2) <math>ac - ad + bc - bd</math></p> <p>(3) <math>2ax - 2ay + \boxed{bx} - \boxed{by}</math></p> <p>(4) <math>4ac + 2ad + \boxed{2bc} + \boxed{bd}</math></p> <p>(5) <math>3ax - ay + \boxed{9bx} - 3by</math></p> <p>(6) <math>8ax + 6ay + 12bx + 9by</math></p>	<p>(1) <math>\boxed{a^2} + \boxed{2}ax + ab + \boxed{2}bx</math></p> <p>(2) <math>2a^2 + 6ax + ab + 3bx</math></p> <p>(3) <math>8a^2 + 2ax - 12ab - 3bx</math></p> <p>(4) <math>8a^2 - 6ax - 12ab + 9bx</math></p> <p>(5) <math>5ax + ab - 25bx - \boxed{5b^2}</math></p> <p>(6) <math>a^2 - ax + 2ab - 2bx</math></p> <p>(7) <math>3ax - 3ab - bx + b^2</math></p> <p>(8) <math>5a^2 - ac + 5ab - bc</math></p>
11	12
<p>(7) <math>6ax + 4ay + 3bx + 2by</math></p> <p>(8) <math>ac + ad - bc - bd</math></p> <p>(9) <math>6ax + 4ay - 3bx - 2by</math></p> <p>(10) <math>25ac + 5ad - 5bc - bd</math></p> <p>(11) <math>2ax + 3ay - 2bx - 3by</math></p> <p>(12) <math>ac - ad - bc + bd</math></p> <p>(13) <math>15ax - 9ay - 20bx + 12by</math></p> <p>(14) <math>6xy - 16x + 15y - 40</math></p> <p>(15) <math>2500xy + 5000x - 500y - 1000</math></p> <p>(16) <math>ac + a + bc + b</math></p> <p>(17) <math>xy - x - y + 1</math></p>	<p>(9) <math>x^2 + \boxed{7}x + 12</math></p> <p>(10) <math>x^2 - x - 12</math></p> <p>(11) <math>x^2 + x - 12</math></p> <p>(12) <math>x^2 - 2x - 15</math></p> <p>(13) <math>x^2 + 2x - 15</math></p> <p>(14) <math>x^2 - 8x + 15</math></p> <p>(15) <math>2x^2 + 3x - 9</math></p> <p>(16) <math>6x^2 - 11x - 10</math></p>

13	14
<p>(1) <math>x^2 + \boxed{6}x + 9</math></p> <p>(2) <math>4x^2 + 4x + 1</math></p> <p>(3) <math>16x^2 + 56x + 49</math></p> <p>(4) <math>\boxed{x^2} - \boxed{9}</math></p> <p>(5) <math>4x^2 - 25</math></p> <p>(6) <math>16x^2 - 49</math></p> <p>(7) <math>9a^2 - 1</math></p> <p>(8) <math>9a^2 + 6a + 1</math></p>	<p><b>I</b></p> <p>(1) <math>2x^2 + \boxed{9}xy + 10y^2</math></p> <p>(2) <math>2x^2 + xy - 10y^2</math></p> <p>(3) <math>2x^2 - xy - 10y^2</math></p> <p>(4) <math>2x^2 - 9xy + 10y^2</math></p> <p>(5) <math>3x^2 + 13xy + 12y^2</math></p> <p>(6) <math>3x^2 - 5xy - 12y^2</math></p> <p>(7) <math>3x^2 + 5xy - 12y^2</math></p> <p>(8) <math>3x^2 - 13xy + 12y^2</math></p>
13	14
<p>(9) <math>\boxed{y^2}</math> <math>x^2 + \boxed{4}xy + 4\boxed{y^2}</math></p> <p>(10) <math>x^2 - 4y^2</math></p> <p>(11) <math>4x^2 - 25y^2</math></p> <p>(12) <math>9x^2 - 16y^2</math></p> <p>(13) <math>x^2 + 6x + 9</math></p> <p>(14) <math>a^2 + 8a + 16</math></p> <p>(15) <math>x^2 + 6xy + 9y^2</math></p> <p>(16) <math>x^2 - 9y^2</math></p>	<p><b>II</b></p> <p>(1) <math>ax + ay + ac + \boxed{bx} + \boxed{by} + \boxed{bc}</math></p> <p>(2) <math>ax + ab + ac + 4x + 4b + 4c</math></p> <p>(3) <math>ax + ay + az - bx - by - bz</math></p> <p>(4) <math>ax + ab - ac - x - b + c</math></p> <p>(5) <math>\boxed{a^2} + ax - ay + ab + bx - \boxed{by}</math></p> <p>(6) <math>2a^2 + 4ab - 4ac - a - 2b + 2c</math></p> <p>(7) <math>2a^2 - ax + 2ay + 6ab - 3bx + 6by</math></p>

# I 15-16

15	16
<p>(1) <math>x^3 + \boxed{6}x^2 + \boxed{11}x + 12</math></p> <p>(2) <math>x^3 - 2x^2 - 5x - 12</math></p> <p>(3) <math>x^3 - 6x^2 + 5x + 12</math></p> <p>(4) <math>x^3 + 7x^2 + 7x - 15</math></p> <p>(5) <math>2x^3 - 3x^2 + 4x + 3</math></p>	<p><b>I</b></p> <p>(1) ① <math>\boxed{-6}</math></p> <p>② <math>\boxed{2}</math> <math>\boxed{\frac{1}{3}}</math></p> <p>③ <math>\boxed{4}</math> <math>\boxed{2a}</math></p> <p>④ <math>\boxed{a}</math></p> <p>⑤ <math>\boxed{1}</math> <math>\boxed{y}</math></p> <p>(2) ① <math>\boxed{3}</math></p> <p>② <math>\boxed{2}</math></p> <p>③ <math>\boxed{y}</math></p> <p>④ <math>\boxed{2}</math> <math>\boxed{4y}</math></p>
15	16
<p>(6) <math>\boxed{4} \boxed{6} \boxed{4} \boxed{8}</math>  <math>2x^3 - \boxed{2x} + 12</math></p> <p>(7) <math>x^3 - x - 6</math></p> <p>(8) <math>2x^3 - x^2 + 9</math></p> <p>(9) <math>x^3 + 8</math></p> <p>(10) <math>3x^3 - 7x^2 + 16x + 60</math></p> <p>(11) <math>3x^3 + 4x^2 - 25</math></p>	<p><b>II</b></p> <p>(1) ① <math>-5x^3 - 3x^2 + \boxed{2x} + 6</math></p> <p>② <math>x^4 + 4x^3 - 2x^2 - 7x - 8</math></p> <p>③ <math>-6x^5 + 4x^3 + 8x^2 + 4x - 7</math></p> <p>④ <math>-3x^2y - 5xy - 15y</math></p> <p>⑤ <math>4x^3 - 4x^2y + 2xy^2 - y^3</math></p> <p>(2) ① <math>2x^3 + 11x^2 - 25</math></p> <p>② <math>6x^3 + 11x^2 + 25</math></p>

17	18
<p>(1) <math>\boxed{-2x^2}</math> <math>\boxed{x}</math> <math>\boxed{5}</math>  <math>-4x^3 - 4x^2 - 11x - 5</math></p> <p>(2) <math>2x^3 + x^2 - 9</math></p> <p>(3) <math>-2x^3 + 7x^2 - 12x + 9</math></p>	<p>(1) <math>\boxed{12}</math> <math>\boxed{3}</math>  <math>2x^4 - 15x^2 - 10x + 3</math></p> <p>(2) <math>6x^4 - 13x^3 + 23x^2 - 13x + 5</math></p>
17	18
<p>(4) <math>6x^3 - 19x^2 + 13x - 2</math></p> <p>(5) <math>8x^3 - 28x^2 + 48</math></p> <p>(6) <math>\boxed{2x}</math>  <math>2x^3 - 2x - 12</math></p> <p>(7) <math>-9x^3 - 9x^2 + 25x + 25</math></p> <p>(8) <math>-6x^4 - 12x^3 + 13x^2 + 20x - 5</math></p>	<p>(3) <math>2x^4 - 8x^3 + 8x^2 - 18</math></p> <p>(4) <math>x^4 + 9x^2 + 14</math></p> <p>(5) <math>3x^5 - 6x^4 - 20x^3 + 5x^2 + 12x - 4</math></p>

# I 19–20

19	20
<p>(1) <math>\boxed{2}</math></p> <p><math>\boxed{5}</math></p> <p><math>x^3 + 6x^2 + 11x + 6</math></p> <p>(2) <math>x^3 - 6x^2 + 11x - 6</math></p>	<p>(1) <math>x^3 + 6x^2 + 12x + 8</math></p> <p>(2) <math>x^4 - 4x^3 - 2x^2 + 12x + 9</math></p>
19	20
<p>(3) <math>x^4 - 1</math></p> <p>(4) <math>x^4 + 4x^3 - 2x^2 - 12x + 9</math></p> <p>(5) <math>x^3 + y^3</math></p>	<p>(3) <math>-\frac{1}{6}x^2 + \frac{37}{60}xy - \frac{1}{2}y^2</math></p> <p>(4) <math>x^3 - 7x + 6</math></p> <p>(5) <math>x^4 - 5x^2 + 4</math></p>

21	22
(1) $c^2 + \boxed{2cd} + d^2$	(1) $x^2 - \boxed{2xy} + y^2$
(2) $x^2 + 2xy + y^2$	(2) $x^2 - 2ax + a^2$
(3) $s^2 + 2st + t^2$	(3) $x^2 - \boxed{10}x + \boxed{25}$
(4) $a^2 + 2ac + c^2$	(4) $a^2 - 8a + 16$
(5) $a^2 + \boxed{6}a + \boxed{9}$	(5) $a^2 - 2a + 1$
(6) $a^2 + 4a + 4$	(6) $4x^2 - 12x + 9$
(7) $x^2 + 8x + 16$	(7) $9x^2 - 30x + 25$
(8) $y^2 + 2y + 1$	(8) $\boxed{4}x^2 - 4xy + y^2$
(9) $x^2 + 10x + 25$	(9) $4x^2 - 12xy + 9y^2$
21	22
(10) $x^2 + 6x + 9$	(10) $9x^2 - 30xy + 25y^2$
(11) $x^2 + 14x + 49$	(11) $64x^2 - 112xy + 49y^2$
(12) $9x^2 + \boxed{30}x + \boxed{25}$	(12) $9a^2 - 24axy + 16x^2y^2$
(13) $9x^2 + 12x + 4$	(13) $x^4 - 2x^2y + y^2$
(14) $25x^2 + 80x + 64$	(14) $x^4 - 2x^3 + x^2$
(15) $4x^2 + 4xy + y^2$	(15) $x^{\boxed{6}} - 2x^3y^2 + y^{\boxed{4}}$
(16) $x^2 + 6xy + 9y^2$	(16) $4x^6 - 4x^3y^2 + y^4$
(17) $16x^2 + 24xy + 9y^2$	(17) $9x^6 - 24x^3y^2 + 16y^4$
(18) $x^{\boxed{4}} + \boxed{4}x^2 + 4$	(18) $\frac{x^2}{4} - \frac{\boxed{xy}}{\boxed{3}} + \frac{y^2}{9}$
(19) $9x^4 + 24x^2y + 16y^2$	(19) $\frac{x^2}{4} - \frac{xy}{6} + \frac{y^2}{36}$
(20) $x^2 + 10xy^2 + 25y^4$	(20) $x^2 - xy + \frac{y^2}{4}$
(21) $\frac{x^2}{4} + \frac{xy}{\boxed{3}} + \frac{y^2}{\boxed{9}}$	(21) $\frac{4}{9}x^2 - \frac{2}{3}xy + \frac{1}{4}y^2$
(22) $\frac{x^2}{9} + \frac{xy}{3} + \frac{y^2}{4}$	

# I 23-25

23	24	25
<p><b>I</b></p> <p>(1) <math>a^2 - 2ab + b^2</math></p> <p>(2) <math>x^2 - 10x + 25</math></p> <p>(3) <math>9x^2 - 6x + 1</math></p> <p>(4) <math>4x^2 - 4xy + y^2</math></p> <p>(5) <math>16x^2 - 8ax + a^2</math></p> <p>(6) <math>a^2x^2 - 6abxy + 9b^2y^2</math></p> <p>(7) <math>x^6 - 2x^3y + y^2</math></p> <p>(8) <math>\frac{x^2}{4} - \frac{xy}{3} + \frac{y^2}{9}</math></p> <p>(9) <math>\frac{x^2}{4} - \frac{xy}{6} + \frac{y^2}{36}</math></p>	<p>(1) <math>4x^2 + 8x + 2</math></p> <p>(2) <math>64x^2 - 96x + 36</math></p> <p>(3) <math>3x^2 + 24xy + 48y^2</math></p> <p>(4) <math>-2x^2 + 8x - 8</math></p> <p>(5) <math>-48x^2 + 72xy - 27y^2</math></p> <p>(6) <math>-3x^2 - 2x - \frac{1}{3}</math></p>	<p>(1) <math>2x^2 + 2y^2</math></p> <p>(2) <math>8x^2 + 18y^2</math></p> <p>(3) <math>4xy</math></p> <p>(4) <math>24xy</math></p> <p>(5) <math>20x</math></p> <p>(6) <math>4abxy</math></p>
23	24	25
<p><b>II</b></p> <p>(1) <math>c^2 + 2cd + d^2</math></p> <p>(2) <math>4x^2 + 4xy + y^2</math></p> <p>(3) <math>4x^2 + 12xy + 9y^2</math></p> <p>(4) <math>x^2 + 10x + 25</math></p> <p>(5) <math>a^2x^2 + 8ax + 16</math></p> <p>(6) <math>\frac{x^2}{9} - \frac{xy}{6} + \frac{y^2}{16}</math></p> <p>(7) <math>x^2 + x + \frac{1}{4}</math></p> <p>(8) <math>x^2 - x + \frac{1}{4}</math></p> <p>(9) <math>x^2 - 2 + \frac{1}{x^2}</math></p> <p>(10) <math>x^2 + 2 + \frac{1}{x^2}</math></p>	<p>(7) <math>-\frac{1}{4}x^2 - xy - y^2</math></p> <p>(8) <math>-x^2 - 2xy - y^2</math></p> <p>(9) <math>x^2 - 6xy + 9y^2</math></p> <p>(10) <math>-48x^4y^2 + 120x^3y^3 - 75x^2y^4</math></p> <p>(11) <math>-4x^2 - 4xy - y^2</math></p> <p>(12) <math>x^3 - 2x + \frac{1}{x}</math></p>	<p>(7) <math>4x^2 + 8xy + 4y^2</math></p> <p>(8) <math>\frac{1}{4}x^2 + \frac{1}{2}xy + \frac{1}{4}y^2</math></p> <p>(9) <math>\frac{4}{9}a^2 - \frac{4}{9}ab + \frac{1}{9}b^2</math></p> <p>(10) <math>4x^2 + 8xy + 4y^2</math></p> <p>(11) <math>\frac{1}{9}a^2 - \frac{1}{3}ab + \frac{1}{4}b^2</math></p>

26	27	28
(1) $x^2 - \boxed{y^2}$	(1) $x^2 + \boxed{8}x + \boxed{15}$	(1) $x^2 - 225$
(2) $x^2 - 16$	(2) $x^2 + \boxed{5}x - \boxed{14}$	(2) $x^2 - 30x + 225$
(3) $4x^2 - 25$	(3) $x^2 - 3x - 10$	(3) $16x^2 - 8x + 1$
(4) $x^2 - 4y^2$	(4) $x^2 - 10x + 21$	(4) $x^2 - 2xy - 15y^2$
(5) $4x^2 - 9y^2$	(5) $x^2 + 11x + 24$	(5) $\boxed{5y} x^2 + 8xy + 15y^2$
(6) $25x^2 - 36y^2$	(6) $x^2 + 4x - 12$	(6) $\frac{x^2}{4} + \frac{xy}{5} + \frac{y^2}{25}$
(7) $x^2y^2 - 1$	(7) $x^2 - 4x - 5$	(7) $9x^4 - \frac{25}{9x^6}$
(8) $x^2 - \frac{4}{9}y^2$	(8) $x^2 - 8x + 15$	
26	27	28
(9) $\boxed{x^2} - 4$	(9) $x^2 + \boxed{4}xy + \boxed{3}y^2$	(8) $3x^2 - 6x - 72$
(10) $16a^2 - 36$	(10) $x^2 + xy - 6y^2$	(9) $-2x^2 + 16xy + 96y^2$
(11) $9x^2 - a^2b^2$	(11) $x^2 + 2xy - 24y^2$	(10) $-\frac{1}{4}x^2 + \frac{3}{2}x + 4$
(12) $\boxed{16} 32x^2 - 18$	(12) $\boxed{6} 2x^2 - 2x - 12$	(11) $6x$
(13) $-3a^2 + 27x^2$	(13) $-3x^2 - 3x + 36$	(12) $6x^2 + x - 1$
(14) $-125x^2 + 5$	(14) $-x^2y^2 + 11xy - 28$	(13) $9x^2 + 18xy + 8y^2$
(15) $-2a^2 + 32$	(15) $2x^2 + 10xy - 100y^2$	(14) $-25x^2 - 25xy - 6y^2$
(16) $\frac{8}{9}x^2 - \frac{9}{8}$	(16) $2x^2 - 42$	
(17) $2x^2 + 10x + 16$	(17) $-16$	
(18) $8x^2 - 6xy + 2y^2$	(18) $-2x + 1$	
(19) $-15x^2 - 4x + 104$	(19) $-5x$	

# I 29–30

29	30
<p>(1) <math>6x^2 + \boxed{31}x + 35</math></p> <p>(2) <math>6x^2 + 19x + 10</math></p> <p>(3) <math>4x^2 + 29x + 7</math></p> <p>(4) <math>3x^2 - \boxed{13}x - 30</math></p> <p>(5) <math>6x^2 + 11x - 10</math></p>	<p>(1) <math>x^6 - 1</math></p> <p>(2) <math>4x^2 - 12x + 9</math></p> <p>(3) <math>a^2x^2 + 2ab^3x + b^6</math></p> <p>(4) <math>\frac{x^2}{4} - xy + y^2</math></p> <p>(5) <math>x^2 - \frac{1}{6}x - \frac{1}{6}</math></p> <p>(6) <math>6x^2 + 28xy + 30y^2</math></p>
29	30
<p>(6) <math>8x^2 + 2xy - 15y^2</math></p> <p>(7) <math>6x^2 + 7xy + 2y^2</math></p> <p>(8) <math>6x^2 - 29xy - 5y^2</math></p> <p>(9) <math>15x^2 + x - 40</math></p> <p>(10) <math>-3x^2 + 22x + 16</math></p> <p>(11) <math>-14x^2 - 11xy + 15y^2</math></p> <p>(12) <math>72x^2 + 47x - 14</math></p> <p>(13) <math>-5x^2 + 51x - 10</math></p>	<p>(7) <math>3x^2 - xy - 10y^2</math></p> <p>(8) <math>-9x^2 - 9x + 4</math></p> <p>(9) <math>\frac{x^2}{4} + \frac{7xy}{24} + \frac{y^2}{12}</math></p> <p>(10) <math>0.1x^2 + 0.6xy + 0.9y^2</math></p> <p>(11) <math>-20x^4 + 38x^2 + 30</math></p> <p>(12) <math>-y^2</math></p>

31		32	
(1) $a(y + \boxed{z})$		(1) $a(x - y)$	
(2) $\boxed{x}(y + z)$		(2) $2x(a + 1)$	
(3) $a(x - y)$		(3) $4bx(a - 1)$	
(4) $x(y - z)$		(4) $y(3x - y)$	
(5) $\boxed{x}(a - b)$		(5) $5xy(x - 2y)$	
(6) $x(c - d)$		(6) $-4x(\boxed{2y} + \boxed{z})$	
(7) $z(a + b)$		(7) $-2b(3a + 4c)$	
(8) $b(a - c)$		(8) $-3y^2(4x + 3z)$	
(9) $\boxed{5}(x - 3)$		(9) $-a^2b^2(5b + 3a)$	
(10) $7(x + 3)$			
31		32	
(11) $\boxed{2}(3a + 2)$	(19) $\boxed{x^5}(ax^2 + b)$	(10) $a(x - y + z)$	
(12) $5(2b - 3)$	(20) $3ax^2(a + 2)$	(11) $a(2x - 3y - z)$	
(13) $2(3x + 4y)$	(21) $6xy(xy + 4)$	(12) $-x(3x - 9y + 2z)$	
(14) $3(3a - 4b)$	(22) $2(x + \boxed{1})$	(13) $-5x(x + 3y + 2z)$	
(15) $\boxed{5x}(x - 2)$	(23) $4(a - 1)$	(14) $5a(x^2 - 7y^2 + 9z^2)$	
(16) $3x(2x - 3)$	(24) $3x(2x + 1)$	(15) $-12a(3x^2 - 5y^2 - 7z^2)$	
(17) $xy(\boxed{x} - \boxed{y})$	(25) $x^2(x + 1)$	(16) $xy(x + y + 1)$	
(18) $ab(a^2 + b^2)$	(26) $3x^2yz^2(z - 2y^2)$	(17) $x(x^2 + x + 1)$	
		(18) $-xy^2z^3(xy^3z^5 + 3z^3 - 2x^4y^2)$	

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 33–34

<b>33</b>		<b>34</b>
(1) $(c-d)(\boxed{y} + \boxed{z})$		(1) $5(x+y)(\boxed{a} + \boxed{b})$
(2) $(a+b)(\boxed{x} + \boxed{3})$		(2) $\boxed{2}(x+y)(2a+b)$
(3) $(b-c)(x-y)$		(3) $3(x+y)(2a+b)$
(4) $(x-2)(a+b)$		(4) $3(x-y)(2a+3b)$
(5) $(a+4)(x-y)$		(5) $4(x+y)(a-3b)$
(6) $(2x-y)(x+y)$		(6) $2(x+3)(2a+3)$
(7) $(3x-1)(a-b)$		(7) $3(x-3)(a+1)$
(8) $(x-2)(3x-5)$		(8) $3(x-3)(x-2)$
(9) $(2a-b)(x-y)$		
(10) $(x+y)(3a + \boxed{1})$		
(11) $(x-y)(2a+1)$		
(12) $(a-b)(x+y)$		
<b>33</b>		<b>34</b>
(13) $(x-y)(a-b)$	(21) $(x+y)(1+5a)$ [ $= (x+y)(5a+1)$ ]	(9) $3c(x+y)(a + \boxed{b})$
(14) $(a-2)(x-4)$	(22) $(8a-1)(1+x)$ [ $= (8a-1)(x+1)$ ]	(10) $2c(x+y)(a+b)$
(15) $(x+y)(2a+b)$	(23) $(x-2y)(6y-5z)$	(11) $\boxed{3c}(x+y)(2a+3b)$
(16) $(a+5b)(7x-3y)$	(24) $(a+b)(2a+b)$	(12) $3x(x+y)(2a+3b)$
(17) $(a-b)(3x+2y)$	(25) $(x+2)(x-2y)$	(13) $4x(x+y)(2a+3b)$
(18) $(c-d)(3y+1)$	(26) $(3c-d)(c-3d)$	(14) $2x(x-y)(5a+b)$
(19) $(x+2y)(a-1)$	(27) $(8y-1)(8x-1)$	(15) $2(x-y)(2a^2-3b)$
(20) $(x-y)(4a-1)$	(28) $(a-10)(a+10)$	(16) $2a(x-y)(2a-3b)$
		(17) $x(x-2y)(4x+y)$
		(18) $a(x+3)(a-2)$
		(19) $2a(x-2)(3a-2)$
		(20) $3x(2a+3b)(3x+4)$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

35	36	
(1) $\boxed{9xy}(x+y)(a+b)$ (2) $3xy(x+y)(3a+4b)$ (3) $3x(x+y)(3a^2+4b^2)$ (4) $3x^2(x+y)(3a+4b)$ (5) $3x(x+y)(3ax+4b)$ (6) $3x(x+y)(3a+4b)$ (7) $3(x+y)(3ax^2+4b)$ (8) $3(x+y)(3ax^2+4)$ (9) $3(x+y)(3ax^2+1)$	(1) $(\boxed{x}+\boxed{y})^2$ (2) $(\boxed{x}-\boxed{y})^2$ (3) $(x+\boxed{3})^2$ (4) $(x-\boxed{2})^2$ (5) $(x+7)^2$ (6) $(x+4)^2$	(7) $(x-5)^2$ (8) $(x+1)^2$ (9) $(2x+1)^2$ (10) $(4x-1)^2$ (11) $(3x+\boxed{5}y)^2$ (12) $(2x-3y)^2$
35	36	
(10) $5xy(a-b)(\boxed{xy}+2)$ (11) $5xy(a-b)(2y+x)$ (12) $5xy(a-b)(2xy+1)$ (13) $3x(x+1)(2x+y)$ (14) $3x(x+1)(2x+1)$ (15) $2(a+3)(2x+1)$ (16) $x(x-y)(x-1)$ (17) $x(x-y)(\boxed{1}-x)$ (18) $x^2(x-y)(1-x)$	(13) $(x-\boxed{3})^2$ (14) $(x+5)^2$ (15) $(x+10)^2$ (16) $(x-6)^2$ (17) $(2x+9)^2$ (18) $(4x-5y)^2$ (19) $(3x-2y)^2$	(20) $(2x+5)^2$ (21) $(2x+7y)^2$ (22) $(5x+y)^2$ (23) $(3x-10)^2$ (24) $(x+3)^2$ (25) $(x-2y)^2$ (26) $(5x+1)^2$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 37–38

<b>37</b>		<b>38</b>	
<b>I</b>			
(1) $(\boxed{2}x + y)^2$	(8) $(3ab - 5x)^2$	(1) $\boxed{2} a(x - y)^2$	
(2) $(y - 1)^2$	(9) $(3x - 1)^2$	(2) $x(x - 5)^2$	
(3) $(6x + 5y)^2$	(10) $(a + 11)^2$	(3) $3(x - 3)^2$	
(4) $(5x - 2y)^2$	(11) $\left(x + \frac{1}{3}\right)^2$	(4) $4(5x - 2)^2$	
(5) $(xy - \boxed{6})^2$	(12) $\left(x - \frac{1}{2}\right)^2$	(5) $5(x - 4y)^2$	
(6) $(ax + 3)^2$	(13) $(4a + 1)^2$	(6) $a^3(x - y)^2$	
(7) $(2xy + 3)^2$			
<b>37</b>		<b>38</b>	
<b>II</b>			
(1) $(x + 7)^2$	(8) $(3x - 2)^2$	(7) $\boxed{4} 4ab(3x + \boxed{2y})^2$	
(2) $(x - 8)^2$	(9) $\left(3x + \frac{1}{2}\right)^2$	(8) $2x(a + 3b)^2$	
(3) <b>non-factorable</b>	(10) $\left(x + \frac{1}{2}\right)^2$	(9) $3a(2xy + 5)^2$	
(4) $(x - 9)^2$	(11) $\left(2x + \frac{1}{4}\right)^2$	(10) $-3(x + 2y)^2$	
(5) $(2x - 3)^2$	(12) <b>non-factorable</b>	(11) $-(x - y)^2$	
(6) $(3x - 5)^2$	(13) $\left(3x - \frac{1}{3}y\right)^2$	(12) $-(x + y)^2$	
(7) <b>non-factorable</b>		(13) $-(2x - y)^2$	

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

39	40
<p><b>I</b></p> <p>(1) <math>(x^2 + \boxed{y^2})^2</math></p> <p>(2) <math>(3x^2 + 1)^2</math></p> <p>(3) <math>(5x^2 + 7y)^2</math></p> <p>(4) <math>(x^2 + y^3)^2</math></p> <p>(5) <math>(x^2 + 6y^5)^2</math></p> <p>(6) <math>(4xy^3 + 3z^4)^2</math></p> <p>(7) <math>-(a - 3x)^2</math></p> <p>(8) <math>-5(2x + y)^2</math></p> <p>(9) <math>-(x - y)^2</math></p> <p>(10) <math>-(3x^2 + 2)^2</math></p>	<p>(1) <math>x^2(x + 1)</math></p> <p>(2) <math>12a(3x^2 + 5y^2 + 7z^2)</math></p> <p>(3) <math>(2x - y)(x + y)</math></p> <p>(4) <math>(a + 1)(3x + 1)</math></p> <p>(5) <math>2(x + 3)(2a + 1)</math></p> <p>(6) <math>3(x - 3)(a + 1)</math></p> <p>(7) <math>3(a - 2)(x - 2)</math></p> <p>(8) <math>a(x - 4)(a + 1)</math></p> <p>(9) <math>x(a + b)(x - 1)</math></p>
39	40
<p>(11) <math>x(\boxed{1} - y)</math></p> <p>(12) <math>2x^2(2y + 3x)</math></p> <p>(13) <math>(a - 4)(x + y)</math></p> <p>(14) <math>(x - y)(3a + 2b)</math></p> <p>(15) <math>(x - y)(a + 1)</math></p> <p>(16) <math>2a(x - 2)(3a - 2)</math></p> <p><b>II</b></p> <p>(1) <math>\boxed{6}</math>   <math>\boxed{3}</math></p> <p>(2) <math>\boxed{9}</math>   <math>\boxed{3}</math></p> <p>(3) <math>\boxed{4}</math>   <math>\boxed{2}</math></p> <p>(4) <math>\boxed{9}</math>   <math>\boxed{4}</math></p>	<p>(10) <math>(2x - y)^2</math></p> <p>(11) <math>(2x - 7y)^2</math></p> <p>(12) <math>(3x^3 - 5y^4)^2</math></p> <p>(13) <math>\left(4x + \frac{1}{2}y\right)^2</math></p> <p>(14) <math>\left(\frac{2}{3}x + \frac{1}{2}y\right)^2</math></p> <p>(15) <math>-3a(x - 4y)^2</math></p> <p>(16) <math>-2x(2y + 5z)^2</math></p> <p>(17) <math>-(3x + 2y)^2</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 41–42

41	42
(1) $(x + y)(x - y)$ (2) $(x + 2)(x - \boxed{2})$ (3) $(x + \boxed{3})(x - \boxed{3})$ (4) $(x + 4)(x - 4)$ (5) $(x + 5)(x - 5)$ (6) $(2x + 5)(2x - 5)$ (7) $(3x + 5)(3x - 5)$ (8) $(4x + 5y)(4x - 5y)$ (9) $(xy + 4)(xy - 4)$ (10) $(3 + 2xy)(3 - 2xy)$ (11) $(3xy + 11)(3xy - 11)$ (12) $(xy + 4a)(xy - 4a)$	(1) $(2x + 1)(2x - 1)$ (2) $(10x + 1)(10x - 1)$ (3) $(3xy + 1)(3xy - 1)$ (4) $(3x^2 + y)(3x^2 - y)$ (5) $(4x^2 + 5y)(4x^2 - 5y)$ (6) $(3x^2y + 11)(3x^2y - 11)$ (7) $(x^3 + y)(x^3 - y)$ (8) $(x + 3y^3)(x - 3y^3)$ (9) $(1 + 6x^3)(1 - 6x^3)$ (10) $(4x^3 + 5y^2)(4x^3 - 5y^2)$
41	42
(13) $(x + 7)(x - 7)$ (14) $(2x + 3)(2x - 3)$ (15) $(x + 9y)(x - 9y)$ (16) $(2x + 5y)(2x - 5y)$ (17) $(2x + 7y)(2x - 7y)$ (18) $(1 + 2x)(1 - 2x)$ (19) $(5 + 6a)(5 - 6a)$ (20) $(3 + 7a)(3 - 7a)$ (21) $(xy + 2z)(xy - 2z)$ (22) $(2ab + 3c)(2ab - 3c)$ (23) $(3xy + 8z)(3xy - 8z)$ (24) $(4ab + 3cd)(4ab - 3cd)$ (25) $(5xy + 7ab)(5xy - 7ab)$	(11) $(2x + 3y)(2x - 3y)$ (12) $(3x + 4y)(3x - 4y)$ (13) $(3xy + 2z)(3xy - 2z)$ (14) $(2 + xy^2)(2 - xy^2)$ (15) $(2x^3 + 5y^4)(2x^3 - 5y^4)$ (16) $(3x^4 + y^3)(3x^4 - y^3)$ (17) $(3xy^2 + 4z^3)(3xy^2 - 4z^3)$ (18) $(4x^2y + 5az^2)(4x^2y - 5az^2)$ (19) $(7xy^2 + 11z)(7xy^2 - 11z)$ (20) $(x^m + y^{3n})(x^{\boxed{m}} - y^{\boxed{3n}})$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

43	44	45
(1) $\boxed{a} \boxed{9y^2}$ $a(x+3y)(x-3y)$ (2) $3ax(y+3)(y-3)$ (3) $y^2(3x+2)(3x-2)$ (4) $x(xy+z)(xy-z)$ (5) $3(2x+y)(2x-y)$ (6) $3(x+5)(x-5)$	(1) $(x+\boxed{3})(x+2)$ (2) $(x+5)(x+2)$ (3) $(x+5)(x+3)$ (4) $(x+2)(x+1)$ (5) $(x+4)(x+1)$ (6) $(x-3)(x-\boxed{2})$ (7) $(x-4)(x-2)$ (8) $(x-5)(x-2)$ (9) $(x-5)(x-3)$ (10) $(x-4)(x-3)$	(1) $(x+\boxed{5})(x+\boxed{3})$ (2) $(x-5)(x-2)$ (3) $(x+5)(x-2)$ (4) $(x-7)(x+2)$ (5) $(x+8)(x-7)$ (6) $(x+3)(x+2)$ (7) $(x-6)(x-2)$ (8) $(x-6)(x+4)$ (9) $(x-5)(x+4)$ (10) $(x-8)(x+5)$
43	44	45
(7) $2(x+6)(x-6)$ (8) $3(xy+2z)(xy-2z)$ (9) $a(x+7y)(x-7y)$ (10) $3x(xy+2z)(xy-2z)$ (11) $ax(x^2+y)(x^2-y)$ (12) $2x(x^2+y)(x^2-y)$ (13) $xy(x+y)(x-y)$ (14) $xyz(x+y)(x-y)$ (15) $xyz(xy+z)(xy-z)$	(11) $(x+3)(x-\boxed{2})$ (12) $(x+4)(x-2)$ (13) $(x+5)(x-2)$ (14) $(x+5)(x-3)$ (15) $(x+7)(x-3)$ (16) $(x+7)(x-1)$ (17) $(x-\boxed{3})(x+2)$ (18) $(x-4)(x+2)$ (19) $(x-5)(x+2)$ (20) $(x-5)(x+3)$ (21) $(x-8)(x+1)$ (22) $(x-5)(x+1)$	(11) $(x-8)(x-3)$ (12) $(x-6)(x-4)$ (13) $(x-6)(x+5)$ (14) $(x-12)(x-1)$ (15) $(x+2)(x-1)$ (16) $(x+6)(x+3)$ (17) $(x-9)(x+6)$ (18) $(x+9)(x-6)$ (19) $(x+15)(x+3)$ (20) $(x-17)(x+5)$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 46-48

46	47	48
<p>(1) <math>(x + \boxed{7})(x + 4)</math></p> <p>(2) <math>(x - 7)(x + 4)</math></p> <p>(3) <math>(x + 7)(x - 4)</math></p> <p>(4) <math>(x + 28)(x + 1)</math></p> <p>(5) <math>(x - 28)(x - 1)</math></p> <p>(6) <math>(x + 28)(x - 1)</math></p> <p>(7) <math>(x - 28)(x + 1)</math></p>	<p>(1) <math>\boxed{5} \boxed{4}</math> <math>3(x + 4)(x + 1)</math></p> <p>(2) <math>2(x + 5)(x - 2)</math></p> <p>(3) <math>2(x + 2)(x - 1)</math></p> <p>(4) <math>2(x - 11)(x - 2)</math></p> <p>(5) <math>a(x + 6)(x - 2)</math></p> <p>(6) <math>3a(x - 4)(x + 1)</math></p>	<p>(1) <math>x(a - b)</math></p> <p>(2) <math>xy(x + y)</math></p> <p>(3) <math>3ax^2(a + 2)</math></p> <p>(4) <math>6xy(xy + 4)</math></p> <p>(5) <math>8xy^2(4x - y^5)</math></p> <p>(6) <math>xy(x + y + 1)</math></p> <p>(7) <math>a^2b(ab - 3 - b^2)</math></p> <p>(8) <math>(x - 5)^2</math></p> <p>(9) <math>(2x + y)^2</math></p>
46	47	48
<p>(8) <math>(x + 9)(x + 4)</math></p> <p>(9) <math>(x + 6)^2</math></p> <p>(10) <math>(x + 12)(x + 3)</math></p> <p>(11) <math>(x - 18)(x - 2)</math></p> <p>(12) <math>(x - 36)(x - 1)</math></p> <p>(13) <math>(x - 12)(x + 10)</math></p> <p>(14) <math>(x + 13)(x - 12)</math></p>	<p>(7) <math>2(x - 6)(x + 2)</math></p> <p>(8) <math>2(x - 8)(x + 5)</math></p> <p>(9) <math>3(x - 8)(x - 3)</math></p> <p>(10) <math>-2(x - 6)(x + 5)</math></p> <p>(11) <math>-3(x + 6)(x - 2)</math></p> <p>(12) <math>-(x + 7)(x - 4)</math></p>	<p>(10) <math>(x - y)(a - b)</math></p> <p>(11) <math>(x + y)(4a + 3b)</math></p> <p>(12) <math>(a - b)(3x + 2y)</math></p> <p>(13) <math>(x - y)(4a - 1)</math></p> <p>(14) <math>(x - y)(1 + 5a)</math></p> <p>(15) <math>4(x + y)(a - 3b)</math></p> <p>(16) <math>(5x^2 + 12y)^2</math></p> <p>(17) <math>x(x - 5)^2</math></p> <p>(18) <math>a(x - 4y)^2</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

49	50	51
(1) $x^5(ax^2 + b)$	(1) $(2x + \boxed{1})(x + 1)$	(1) $(2x + 5)(x + \boxed{1})$
(2) $3(x + 2)(2a + b)$	(2) $(3x + \boxed{1})(x + \boxed{1})$	(2) $(3x + \boxed{4})(x + 1)$
(3) $(2x - 7y)^2$	(3) $(\boxed{4}x + 1)(x + 1)$	
(4) $(2x + 5y)(2x - 5y)$	(4) $(\boxed{5}x - \boxed{1})(x - 1)$	
(5) $(4x^3 + 7ay^2)(4x^3 - 7ay^2)$	(5) $(\boxed{4}x + 1)(x - \boxed{1})$	
(6) $3ax(xy + 3z)(xy - 3z)$	(6) $(3x - 1)(x - 1)$	
(7) $-(x - 4)^2$	(7) $(4x + 1)(x - 1)$	
(8) $-3a(x - 4y)^2$		
49	50	51
(9) $(x - 5)(x - 2)$	(8) $(5x - \boxed{1})(x + \boxed{1})$	(3) $(\boxed{3}x + \boxed{5})(x + 1)$
(10) $(x - 28)(x + 1)$	(9) $(\boxed{3}x + 1)(2x + 1)$	(4) $(2x - \boxed{5})(x - 1)$
(11) $(x + 12)(x + 3)$	(10) $(\boxed{4}x - 1)(\boxed{3}x - 1)$	(5) $(3x - 4)(x - 1)$
(12) $2(x - 10)(x - 4)$	(11) $(12x - 1)(x - 1)$	(6) $(2x - 3)(x - 1)$
(13) $-(x + 7)(x - 4)$	(12) $(6x - 1)(2x + 1)$	(7) $(2x + 3)(x - 1)$
(14) $-2(x - 12)(x - 1)$	(13) $(7x + 1)(4x + 1)$	(8) $(2x + 5)(x - 1)$
(15) $-3a(x + 5)(x - 2)$	(14) $(7x + 1)(4x - 1)$	(9) $(3x + 4)(x - 1)$
(16) $2x(x + 2)(x - 1)$		(10) $(3x + 5)(x - 1)$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 52–54

52	53	54
(1) $(3x + \boxed{2})(x + \boxed{1})$	(1) $(3x + 2)(x + 2)$	(1) $(5x + 3)(x + 2)$
(2) $(2x + 1)(x + 3)$	(2) $(3x - 2)(x - 2)$	(2) $(5x + 2)(x + 3)$
(3) $(2x - 1)(x - 3)$	(3) $(3x + 2)(x - 2)$	(3) $(5x + 6)(x + 1)$
(4) $(2x - 3)(x - 1)$	(4) $(3x - 2)(x + 2)$	(4) $(5x + 1)(x + 6)$
(5) $(2x + 3)(x - 1)$	(5) $(3x + 4)(x + 1)$	(5) $(5x - 3)(x + 2)$
(6) $(2x - 3)(x + 1)$	(6) $(3x - 4)(x - 1)$	(6) $(5x + 1)(x - 6)$
(7) $(2x + 1)(x - 3)$	(7) $(3x - 1)(x + 4)$	
52	53	54
(8) $(2x + 5)(x + 1)$	(9) $(5x + 4)(x + 1)$	(7) $(5x - 6)(x - 1)$
(9) $(2x - 5)(x - 1)$	(10) $(5x + 2)(x + 2)$	(8) $(5x - 3)(x - 2)$
(10) $(2x + 5)(x - 1)$	(11) $(5x - 2)(x - 2)$	(9) $(5x - 2)(x - 3)$
(11) $(2x - 5)(x + 1)$	(12) $(5x + 1)(x + 4)$	(10) $(5x + 2)(x - 3)$
(12) $(2x + 1)(x + 5)$	(13) $(5x - 1)(x - 4)$	(11) $(5x - 2)(x + 3)$
(13) $(2x - 1)(x - 5)$	(14) $(5x + 2)(x - 2)$	(12) $(5x + 6)(x - 1)$
(14) $(2x + 1)(x - 5)$	(15) $(5x - 2)(x + 2)$	
	(16) $(5x - 4)(x + 1)$	

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

<b>55</b>	<b>56</b>	<b>57</b>
(1) $(2x+3)(2x+1)$	(1) $(2x-1)(x+\boxed{5})$	(1) $(2x+3)(x+5)$
(2) $(2x-3)(2x-1)$	(2) $(4x+1)(x+3)$	(2) $(2x+5)(x+3)$
(3) $(4x-3)(x-1)$	(3) $(2x-3)(2x-1)$	(3) $(2x-5)(x+3)$
(4) $(4x-1)(x+3)$	(4) $(3x-2)(x-2)$	(4) $(2x-3)(x+4)$
(5) $(4x+1)(x-3)$	(5) $(4x-7)(x+1)$	(5) $(3x+2)(x+4)$
(6) $(2x+3)(2x-1)$		
<b>55</b>	<b>56</b>	<b>57</b>
(7) $(6x+5)(x+1)$	(6) $(2x-3)(x+1)$	(6) $(3x-4)(2x+3)$
(8) $(6x+1)(x+5)$	(7) $(3x-1)(x+5)$	(7) $(3x-4)(2x-5)$
(9) $(3x+5)(2x-1)$	(8) $(3x-7)(2x+1)$	(8) $(5x-7)(3x-2)$
(10) $(3x-1)(2x+5)$	(9) $(7x+2)(3x-1)$	(9) $(5x+2)(3x-7)$
(11) $(6x-1)(x+5)$	(10) $(2x+7)(x-4)$	
(12) $(3x+5)(2x+1)$	(11) $(5x-1)(2x+3)$	(10) $(5x-4)(2x+3)$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 58–60

58	59	60
<p>(1) <math>\boxed{5} \boxed{3}</math> <math>3(2x-1)(x+3)</math></p> <p>(2) <math>2(2x-1)(x+5)</math></p> <p>(3) <math>-3(2x-3)(x+1)</math></p> <p>(4) <math>-2(2x-3)(x-1)</math></p>	<p>(1) <math>2(x-3)^2</math></p> <p>(2) <math>3(x+4)^2</math></p> <p>(3) <math>a(x-4)(x+2)</math></p> <p>(4) <math>(2x+3)(x+5)</math></p> <p>(5) <math>x(2x+5)(x+1)</math></p>	<p>(1) <math>-2(x-2)(x+1)</math></p> <p>(2) <math>-2(x-6)(x+2)</math></p> <p>(3) <math>x(x-12y)(x-2y)</math></p> <p>(4) <math>(x^2+4)(x+3)(x-3)</math></p> <p>(5) <math>(x+2)^{\boxed{2}}(x-2)^{\boxed{2}}</math></p>
58	59	60
<p>(5) <math>\boxed{21}</math> <math>x(2x-3)(x+7)</math></p> <p>(6) <math>a(2x+1)(x-2)</math></p> <p>(7) <math>2(5x-6)(x+1)</math></p> <p>(8) <math>-2(6x+5)(2x-3)</math></p>	<p>(6) <math>(x^2+y^2)(x+\boxed{y})(x-\boxed{y})</math></p> <p>(7) <math>(x^2+4)(x+2)(x-2)</math></p> <p>(8) <math>(x^4+y^4)(x^2+y^2)(x+y)(x-y)</math></p> <p>(9) <math>x(x^2+4)(x+2)(x-2)</math></p> <p>(10) <math>3(x^2+4y^2)(x+2y)(x-2y)</math></p>	<p>(6) <math>(a-2b)(x+y)</math></p> <p>(7) <math>3(a-b)(x+2)</math></p> <p>(8) <math>\boxed{9}</math> <math>(a+b)(x-3)^2</math></p> <p>(9) <math>(a+b)(x+3)(x-3)</math></p> <p>(10) <math>(a-b)(x+2)(x-1)</math></p> <p>(11) <math>(a-b)(2x-3)(x-1)</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

61	62	63
(1) $\boxed{5}$ $(x+y)(x+y+5)$ (2) $(x+y)(x+y-3)$ (3) $(x-y)(x-y+4)$ (4) $(x-y)(x-y-5)$ (5) $(x-y)(x-y-\boxed{1})$ (6) $(x+y)(x+y-a)$	(1) $\boxed{y}$ $x(x-y)(3x-4y)$ (2) $2(x-y)(2-x+y)$ (3) $6(x-3y)(x-y)$ (4) $\boxed{a^2}$ $a(x-2y)(a+x)(a-x)$	(1) $(x+y)(2x+y)(x-y)$ (2) $2(x-2y)^2(x+y)$ (3) $2x(x+1)(x+3)(x-2)$
61	62	63
(7) $\boxed{a}$ $(x+y)(a-x-y)$ (8) $(x+y)(3-x-y)$ (9) $(x-y)(a-x+y)$ (10) $\boxed{b^2}$ $(x+y)(ax+ay+b^2)$ (11) $(x+y)(x^2+xy+y^2)$ (12) $a(x+y)(x+y+2)$ (13) $3(x-y)(x-y-a)$ (14) $2(x-y)(x-y-2)$	(5) $-2(x-2y)(x+2y)$ (6) $x(2x-y)(x^2+2xy-y^2)$ (7) $-2(x-2y)(x+y)$ (8) $x(2x-y)(x-y)^2$	(4) $x(2a+b+c)$ (5) $3x(a+2b)$ (6) $2x(a+b+c)$ (7) $(a-b)(x-5)(x+2)$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 64–66

64	65	66
<p>(1) <math>(x+y+\boxed{3})(x+y-\boxed{3})</math></p> <p>(2) <math>(x-y+z)(x-y-z)</math></p> <p>(3) <math>(x+y+z)(x-y-z)</math></p> <p>(4) <math>(x+y-z)(x-y+z)</math></p> <p>(5) <math>(3+x-2y)(3-x+2y)</math></p>	<p>(1) <math>-4(x+y)(x-2y)</math></p> <p>(2) <math>-4y(x-2y)</math></p> <p>(3) <math>-8(2x-y)(x-y)</math></p> <p>(4) <math>4(3x+y+2z)(2x-y-2z)</math></p>	<p>(1) <math>(x+y+\boxed{2})^2</math></p> <p>(2) <math>(x+y-3)^2</math></p> <p>(3) <math>(x+y-5)^2</math></p> <p>(4) <math>(a-b+4)^2</math></p> <p>(5) <math>(a-b-7)^2</math></p> <p>(6) <math>(a-b+11)^2</math></p>
64	65	66
<p>(6) <math>(a+b+c+d)(a+b-c-d)</math></p> <p>(7) <math>-(2x-y-z)(y-z)</math></p> <p>(8) <math>(5x+3)(x+1)</math></p> <p>(9) <math>4(4x-1)(x+3)</math></p> <p>(10) <math>(a+b+c+d)(a+b+c-d)</math></p>	<p>(5) <math>\boxed{2}</math></p> <p><math>(2x+1+y)(2x+1-y)</math>  <math>[=(2x+y+1)(2x-y+1)]</math></p> <p>(6) <math>(x+1+y)(x+1-y)</math>  <math>[=(x+y+1)(x-y+1)]</math></p> <p>(7) <math>(a-b+3x)(a-b-3x)</math></p> <p>(8) <math>\boxed{b^2}</math></p> <p><math>(x+a+b)(x-a-b)</math>  <math>[=- (a+b+x)(a+b-x)]</math></p>	<p>(7) <math>(x+y-4a)^2</math></p> <p>(8) <math>(x+y-5a)^2</math></p> <p>(9) <math>(x+2y+z)^2</math></p> <p>(10) <math>(x+2y-2z)^2</math></p> <p>(11) <math>(2x-y+1)^2</math></p> <p>(12) <math>(3x-2y+4z)^2</math></p> <p>(13) <math>(3x+2y)^2</math></p> <p>(14) <math>(3x-2y)^2</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

67	68	69
(1) $(x + y + z)^2$ (2) $(x - y - z)^2$ (3) $(x + 3a + 3b)^2$ (4) $(x - 3a - 3b)^2$ (5) $(\boxed{2}x + a + b)^2$ (6) $(x - y)^2$	(1) $(x + y - \boxed{3})(x + y - \boxed{2})$ (2) $(x + y - 5)(x + y + 3)$ (3) $(x + y + 6)(x + y - 3)$ (4) $(x + y - 5)(x + y - 2)$	(1) $\boxed{2}$ $(2x + 2y + 3)(x + y + 1)$ (2) $(2x + 2y - 3)(x + y + 2)$ (3) $(2x + 2y + 1)(x + y - 5)$ (4) $(3x + 3y - 1)(x + y - 4)$
67	68	69
(7) $\boxed{3} \quad \boxed{6}$ $\boxed{3}$ $\boxed{9}(x + 2y)^2$ (8) $4(2x + 3y)^2$ (9) $9(2x + 5y)^2$ (10) $9(x - 4y)^2$	(5) $(x - y + 3)(x - y + 1)$ (6) $(x - y + 3z)(x - y + z)$ (7) $(x + y - 5z)(x + y + 3z)$ (8) $(5x + y)(3x + y)$ (9) $(5x - 2y)(3x - 2y)$ (10) $(7x - y)(4x - y)$	(5) $(7x + 2y)(2x + y)$ (6) $(3x + 2y)(x - 2y)$ (7) $(7x + 6y)(x + 3y)$

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 70-72

70	71	72
<p>(1) <input type="text" value="4"/>  <math>2(5x+8y)(x+y)</math></p> <p>(2) <math>3(x+2y)(2x+3y)</math></p> <p>(3) <math>2(2x+3y)(3x+4y)</math></p>	<p><input type="text" value="I"/></p> <p>(1) <input type="text" value="x"/> <input type="text" value="y"/>  <input type="text" value="x"/> <input type="text" value="y"/>  <input type="text" value="x"/> <input type="text" value="y"/>  <math>(x-y)(a+b)</math></p> <p>(2) <math>(x-2y)(a+b)</math></p> <p>(3) <input type="text" value="x"/> <input type="text" value="y"/>  <input type="text" value="x"/> <input type="text" value="y"/>  <math>(x+y)(a-b)</math></p>	<p>(1) <input type="text" value="x"/> <input type="text" value="2y"/>  <math>(x-2y)(2x+3y)(2x-3y)</math></p> <p>(2) <input type="text" value="a"/> <input type="text" value="b"/>  <math>(a-b)(x-3)^2</math></p> <p>(3) <math>(a-b)(x+2)(x-1)</math></p>
70	71	72
<p>(4) <input type="text" value="4"/>  <math>-2(x+3y)(3x-2y)</math></p> <p>(5) <math>2(7x+4y)(x+y)</math></p> <p>(6) <math>4(3x+y)(x-y)</math></p>	<p>(4) <math>(x-3y)(a+b)</math></p> <p>(5) <math>(x-2y)(a-b)</math></p> <p><input type="text" value="II"/></p> <p>(1) <input type="text" value="-"/></p> <p>(2) <input type="text" value="-"/></p> <p>(3) <input type="text" value="+"/></p> <p>(4) <input type="text" value="-"/></p> <p>(5) <input type="text" value="-"/></p>	<p>(4) <math>(a-b)(2x+3)(x-2)</math></p> <p>(5) <math>(a-b)(3x-4)(2x+3)</math></p> <p>(6) <math>(x-y)(x-2y)(x+y)</math></p> <p>(7) <math>(a-b)(x-5)(x+2)</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

73	74
<p><b>I</b></p> <p>(1) <input type="checkbox"/> -</p> <p>(2) <input type="checkbox"/> +</p> <p>(3) <input type="checkbox"/> -</p> <p>(4) <input type="checkbox"/> +</p> <p><b>II</b></p> <p>(1) <input type="checkbox"/> <math>y</math> <math>(x - y)(x - y - 2)</math></p> <p>(2) <math>(x - y)^2(1 - 3x + 3y)</math>  <math>[= -(x - y)^2(3x - 3y - 1)]</math></p>	<p>(1) <math>y(x - y)(4x - 3y)</math></p> <p>(2) <input type="checkbox"/> <math>3y</math>  <input type="checkbox"/> <math>3y</math>  <input type="checkbox"/> <math>3x</math> <input type="checkbox"/> <math>3y</math>  <math>3x(x - 3y)(x - y)</math></p> <p>(3) <math>-2x(x - 3y)(x - 2y)(x - y)</math></p>
73	74
<p>(3) <math>(x - y)(x - y - 2)</math></p> <p>(4) <math>(x - y)^2(1 + 3x - 3y)</math>  <math>[= (x - y)^2(3x - 3y + 1)]</math></p> <p>(5) <math>x(x - 2y)(3x - 2y)</math></p> <p>(6) <math>(x - y)(2 - x + y)</math>  <math>[= -(x - y)(x - y - 2)]</math></p>	<p>(4) <input type="checkbox"/> <math>y</math> <input type="checkbox"/> <math>z</math>  <math>(y - z)(x - 1)</math></p> <p>(5) <math>(x - y)(x - y - 1)</math></p> <p>(6) <math>(a + b)(6x - 1)</math></p> <p>(7) <math>2(y - z)(x + 2z)</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 75-76

75	76
<p>(1) <math>\boxed{x} \boxed{y}</math>  <math>(x-y)(1-a)</math></p> <p>(2) <math>-y(a-2b)</math></p> <p>(3) <math>3x(x-2y)(x-3y)(x+y)</math></p>	<p>(1) <math>\boxed{x} \boxed{y}</math>  <math>(x-y)(a+b)</math></p> <p>(2) <math>(x+y)(a-b)</math></p> <p>(3) <math>(x-y)(a-b)</math></p> <p>(4) <math>(b+c)(a+d)</math></p> <p>(5) <math>(b-c)(a+d)</math></p>
75	76
<p>(4) <math>(a-2b)(x-1)</math></p> <p>(5) <math>(a-b)(x^2+4)(x+2)(x-2)</math></p> <p>(6) <math>-3x(x-3y)(x-2y)(x-y)</math></p>	<p>(6) <math>\boxed{b} \boxed{c}</math>  <math>(b-c)(a-d)</math></p> <p>(7) <math>\boxed{b}</math>  <math>(b-c)(a-d)</math></p> <p>(8) <math>(b-c)(a+d)</math></p> <p>(9) <math>(b+d)(a-c)</math></p> <p>(10) <math>(b-d)(a-c)</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

77	78
<p>(1) <math>\boxed{a}</math> <math>(a+x)(a+y)</math></p> <p>(2) <math>(a+x)(a-y)</math></p> <p>(3) <math>(a-x)(a+y)</math></p> <p>(4) <math>(2a+3b)(x-y)</math></p>	<p>(1) <math>\boxed{4}</math> <math>(x+4)(x^2+2)</math></p> <p>(2) <math>(x-4)(x^2+2)</math></p> <p>(3) <math>(x+4)(x^2-2)</math></p> <p>(4) <math>(x-4)(x^2-2)</math></p> <p>(5) <math>(x+1)(x^2+1)</math></p> <p>(6) <math>(x-1)^2(x+1)</math></p>
77	78
<p>(5) <math>(a+2x)(a+b)</math></p> <p>(6) <math>(a+2x)(a-b)</math></p> <p>(7) <math>(2x-a)(a+b)</math></p> <p>(8) <math>(a-3b)(2x+y)</math></p>	<p>(7) <math>(2x+3)(x^2+2)</math></p> <p>(8) <math>(2x+3)(x^2-2)</math></p> <p>(9) <math>(x-2)(x^2+1)</math></p> <p>(10) <math>(x+1)(x+2)(x-2)</math></p> <p>(11) <math>(y+1)(x+1)</math></p> <p>(12) <math>(y+1)(y-1)(x^2+1)</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

# I 79–80

79	80
<p>(1) <math>(x - y)(x - 1)</math></p> <p>(2) <math>(1 - x)^2(1 + x)</math></p> <p>(3) <math>(y + 1)(x + 1)</math></p> <p>(4) <math>(y + z)(x^2 + y^2)</math></p>	<p>(1) <math>x(x - 2y)(3x - 2y)</math></p> <p>(2) <math>2(a - 2b)(x - 2y)</math></p> <p>(3) <math>-2x(x - 3y)(x - 2y)(x - y)</math></p>
79	80
<p>(5) <math>x(x - 2)(x^2 + 1)</math></p> <p>(6) <math>(y + 1)(x + y)(x - y)</math></p> <p>(7) <math>(y - 1)(x - 1)</math></p> <p>(8) <math>(x - 2)^2(x + 2)</math></p>	<p>(4) <math>(x - y)(x - y - 1)</math></p> <p>(5) <math>2(y - z)(x + 2z)</math></p> <p>(6) <math>3(2 - 3x^2)(1 + 2y)</math></p> <p>(7) <math>(y + 1)(y - 1)(x + 1)(x - 1)</math></p>

NOTE: EQUIVALENT ANSWERS SHOULD BE MARKED CORRECT

<b>81</b>		<b>82</b>	
<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">I</div> <p>(1) 25                      (6) 121</p> <p>(2) 64                      (7) 144</p> <p>(3) 81                      (8) 169</p> <p>(4) <math>\frac{9}{16}</math>                      (9) 196</p> <p>(5) 0.04                      (10) 225</p>	<p>(1) <span style="border: 1px solid black; padding: 2px;">2</span></p> <p>(2) 4</p> <p>(3) 6</p> <p>(4) 8</p> <p>(5) 1</p>	<p>(6) 3</p> <p>(7) 5</p> <p>(8) 7</p> <p>(9) 9</p> <p>(10) 10</p>	
<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">II</div> <p>(1) <span style="border: 1px solid black; padding: 2px;">2</span>    <span style="border: 1px solid black; padding: 2px;">-2</span></p> <p>(2) <span style="border: 1px solid black; padding: 2px;">3</span>    <span style="border: 1px solid black; padding: 2px;">-3</span></p> <p>(3) <span style="border: 1px solid black; padding: 2px;">6</span>    <span style="border: 1px solid black; padding: 2px;">-6</span></p>			
<b>81</b>		<b>82</b>	
<p>(4) <span style="border: 1px solid black; padding: 2px;">7</span>    <span style="border: 1px solid black; padding: 2px;">-7</span></p> <p>(5) <span style="border: 1px solid black; padding: 2px;">8</span>    <span style="border: 1px solid black; padding: 2px;">-8</span></p> <p>(6) <span style="border: 1px solid black; padding: 2px;">9</span>    <span style="border: 1px solid black; padding: 2px;">-9</span></p> <p>(7) <span style="border: 1px solid black; padding: 2px;">10</span>    <span style="border: 1px solid black; padding: 2px;">-10</span></p> <p>(8) <span style="border: 1px solid black; padding: 2px;">11</span>    <span style="border: 1px solid black; padding: 2px;">-11</span></p> <p>(9) <span style="border: 1px solid black; padding: 2px;">12</span>    <span style="border: 1px solid black; padding: 2px;">-12</span></p> <p>(10) <span style="border: 1px solid black; padding: 2px;">13</span>    <span style="border: 1px solid black; padding: 2px;">-13</span></p>	<p>(11) <span style="border: 1px solid black; padding: 2px;"><math>-\frac{3}{5}</math></span></p> <p>(12) <span style="border: 1px solid black; padding: 2px;"><math>\frac{6}{7}</math></span>    <span style="border: 1px solid black; padding: 2px;"><math>-\frac{6}{7}</math></span></p> <p>(13) <span style="border: 1px solid black; padding: 2px;"><math>\frac{8}{9}</math></span>    <span style="border: 1px solid black; padding: 2px;"><math>-\frac{8}{9}</math></span></p> <p>(14) <span style="border: 1px solid black; padding: 2px;">-0.3</span></p> <p>(15) <span style="border: 1px solid black; padding: 2px;">0.4</span>    <span style="border: 1px solid black; padding: 2px;">-0.4</span></p> <p>(16) <span style="border: 1px solid black; padding: 2px;">0.1</span>    <span style="border: 1px solid black; padding: 2px;">-0.1</span></p>	<p>(11) 11</p> <p>(12) 12</p> <p>(13) 13</p> <p>(14) 14</p> <p>(15) 15</p> <p>(16) 16</p> <p>(17) 17</p> <p>(18) 18</p> <p>(19) 19</p> <p>(20) 20</p> <p>(21) 0</p>	<p>(22) <math>\frac{2}{5}</math></p> <p>(23) <math>\frac{3}{5}</math></p> <p>(24) <math>\frac{7}{9}</math></p> <p>(25) <math>\frac{8}{11}</math></p> <p>(26) <math>\frac{3}{10}</math></p> <p>(27) 0.3</p> <p>(28) 0.6</p> <p>(29) 0.7</p> <p>(30) 0.1</p> <p>(31) 1.1</p> <p>(32) 1.2</p>

# I 83–85

83		84	85
(1) 10	(9) 0.2	(1) $\frac{1}{2}$	(1) 22
(2) 11	(10) 0.6	(2) $\frac{1}{4}$	(2) 23
(3) 12	(11) 0.1	(3) $\frac{1}{12}$	(3) 31
(4) 20	(12) 0.7	(4) $\frac{5}{8}$	(4) 32
(5) 21	(13) 0.8	(5) $\frac{7}{11}$	(5) 51
(6) 25	(14) 1.1	(6) $\frac{6}{13}$	(6) 55
(7) 28	(15) 1.2	(7) $\frac{14}{17}$	(7) $\frac{15}{14}$
(8) 30	(16) 1.3		(8) $\frac{12}{25}$
83		84	85
(17) $\frac{2}{7}$		(8) 40	(9) 1.3
(18) $\frac{3}{8}$		(9) 50	(10) 1.5
(19) $\frac{5}{12}$		(10) 45	(11) 1.7
(20) $\frac{1}{11}$		(11) 0.7	(12) 3.5
(21) 15		(12) 0.0 <span style="border: 1px solid black; padding: 0 2px;">3</span>	(13) 0.07
(22) 14		(13) 0.05	(14) 0.00 <span style="border: 1px solid black; padding: 0 2px;">6</span>
(23) 20		(14) 0.16	(15) 0.009
(24) 42		(15) 90	(16) 0.012
(25) 6			
(26) 12			

86	87	88
<p><b>I</b></p> <p>(1) <math>\sqrt{2} &gt; 1.4</math>  <math>\sqrt{2} &lt; 1.5</math></p> <p>(2) <math>\sqrt{3} &gt; 1.7</math>  <math>\sqrt{3} &lt; 1.8</math></p> <p>(3) <math>\sqrt{5} &gt; 2.1</math>  <math>\sqrt{5} &gt; 2.2</math></p> <p>(4) <math>\sqrt{6} &gt; 2.4</math>  <math>\sqrt{6} &lt; 2.5</math></p>	<p>(1) ① <u>2</u></p> <p>② <u>2.3</u></p> <p>③ <u>2.23</u></p> <p><u>2.23</u></p>	<p>(1) ① <u>2</u> <u>3</u></p> <p>② <u>2.8</u> <u>2.9</u></p> <p><u>2.8</u> <u>2.9</u></p> <p><u>2.8</u></p>
86	87	88
<p><b>II</b></p> <p>(1) <u>1.4</u> &lt; <u><math>\sqrt{2}</math></u> &lt; <u>1.5</u></p> <p>(2) <u>1.7</u> &lt; <u><math>\sqrt{3}</math></u> &lt; <u>1.8</u></p> <p>(3) <u><math>\sqrt{5}</math></u> &lt; <u>2.24</u> &lt; <u>2.25</u></p> <p>(4) <u>2.63</u> &lt; <u>2.64</u> &lt; <u><math>\sqrt{7}</math></u></p>	<p>(2) ① <u>2</u></p> <p>② <u>1.7</u> <u>1.8</u></p> <p>③ <u>1.73</u> <u>1.74</u></p> <p><u>1.73</u></p> <p>(3) ① <u>3</u> <u>4</u></p> <p>② <u>3.1</u> <u>3.2</u></p> <p>③ <u>3.16</u> <u>3.17</u></p> <p><u>3.16</u></p>	<p>(2) ① <u>3</u> <u>4</u></p> <p>② <u>3.8</u> <u>3.9</u></p> <p><u>3.8</u> <u>3.9</u></p> <p><u>3.8</u></p> <p>(3) ① <u>5</u> <u>6</u></p> <p>② <u>5.4</u> <u>5.5</u></p> <p><u>5.4</u> <u>5.5</u></p> <p><u>5.4</u></p>

# I 89-90

**89**

(1)  
[Sol]

5	5	3
5	2 8 0 9	2 5
1 0 3	3 0 9	3 0 9
3	3 0 9	0

53

**90**

I  
(1)  
[Sol]

2	0.	2	5
2	0. 0 6 2 5	4	2 5
4 5	2 2 5	2 2 5	0
5	2 2 5	0	0

0.25

**89**

(2)  
[Sol]

4	4	2
4	1 7 6 4	1 6
8 2	1 6 4	1 6 4
2	1 6 4	0

42

(3)  
[Sol]

1	1	3	7
1	1 8 7 6 9	6 9	1 8 6 9
2 3	8 7	1 8 6 9	1 8 6 9
3	6 9	0	0
2 6 7	1 8 6 9	0	0
7	1 8 6 9	0	0

137

**90**

(2)  
[Sol]

6	6.	7
6	4 4 8 9	3 6
1 2 7	8 8 9	8 8 9
7	8 8 9	0

6.7

II  
[Sol]

1	1.	4	1	4
1	2. 0 0 0 0 0 0	1	0 0	9 6
2 4	9 6	4 0 0	2 8 1	1 1 9 0 0
4	4 0 0	2 8 1	1 1 2 9 6	6 0 4
2 8 1	2 8 1	1 1 9 0 0	1 1 2 9 6	6 0 4
1	1 1 9 0 0	1 1 2 9 6	6 0 4	0
2 8 2 4	1 1 2 9 6	6 0 4	0	0
4	6 0 4	0	0	0

1.414

91		92		93	
<b>I</b> (1) $\boxed{4}$ (2) 9 (3) 8 (4) 8		(1) $\boxed{3}\sqrt{2}$ (2) $2\sqrt{7}$ (3) $\boxed{3}\sqrt{3}$ (4) $2\sqrt{2}$ (5) $2\sqrt{5}$ (6) $3\sqrt{5}$ (7) $2\sqrt{13}$ (8) $5\sqrt{2}$ (9) $3\sqrt{7}$ (10) $2\sqrt{11}$		(1) $2\sqrt{\boxed{15}}$ (2) $2\sqrt{21}$ (3) $6\sqrt{3}$ (4) $4\sqrt{7}$ (5) $2\sqrt{30}$	
<b>II</b> (1) $\sqrt{\boxed{10}}$ (2) $\sqrt{15}$ (3) $\sqrt{21}$					
91		92		93	
(4) $\sqrt{65}$	(10) $\sqrt{\frac{\boxed{2}}{7}}$	(11) $4\sqrt{3}$	(18) $7\sqrt{2}$	(6) $8\sqrt{2}$	
(5) $\sqrt{51}$	(11) $\sqrt{\frac{1}{\boxed{6}}}$	(12) $4\sqrt{2}$	(19) $3\sqrt{11}$	(7) $7\sqrt{3}$	
(6) $\sqrt{187}$	(12) $\sqrt{\boxed{70}}$	(13) $6\sqrt{2}$	(20) $2\sqrt{10}$	(8) $9\sqrt{2}$	
(7) $\sqrt{133}$	(13) $\sqrt{231}$	(14) $2\sqrt{17}$	(21) $3\sqrt{6}$	(9) $8\sqrt{3}$	
(8) $\sqrt{\frac{\boxed{3}}{10}}$	(14) $\sqrt{\frac{1}{\boxed{15}}}$	(15) $5\sqrt{3}$	(22) $3\sqrt{10}$	(10) $4\sqrt{15}$	
(9) $\sqrt{\frac{10}{\boxed{21}}}$		(16) $2\sqrt{19}$	(23) $4\sqrt{6}$		
		(17) $4\sqrt{5}$			

# I 94–96

94	95	96
<p>(1) <math>2 \times 3^2</math></p> <p>(2) <math>2^3 \times 3</math></p> <p>(3) <math>3^3 \times 2</math></p> <p>(4) <math>2^3 \times 7</math></p> <p>(5) <math>2^6</math></p> <p>(6) <math>2^2 \times 5^2</math></p>	<p><b>I</b></p> <p>(1) <math>\boxed{3} \boxed{5} 15</math></p> <p>(2) <math>\boxed{7} \boxed{14} \sqrt{\boxed{7}}</math></p> <p>(3) <math>15\sqrt{15}</math></p> <p>(4) 30</p> <p>(5) <math>84\sqrt{14}</math></p>	<p>(1) <math>\boxed{5} \boxed{3} 12\sqrt{\boxed{15}}</math></p> <p>(2) <math>4\sqrt{21}</math></p> <p>(3) <math>12\sqrt{6}</math></p> <p>(4) <math>4\sqrt{65}</math></p> <p>(5) <math>\boxed{3} \boxed{3} 18</math></p> <p>(6) 12</p> <p>(7) 30</p> <p>(8) 24</p>
94	95	96
<p>(7) <math>2^3 \times 3 \times 5</math></p> <p>(8) <math>2^7</math></p> <p>(9) <math>3^4 \times 2</math></p> <p>(10) <math>2^6 \times 3</math></p> <p>(11) <math>2^3 \times 5^2</math></p> <p>(12) <math>3^2 \times 5^2</math></p> <p>(13) <math>2^6 \times 3^2</math></p> <p>(14) <math>2^4 \times 7^2</math></p>	<p><b>II</b></p> <p>(1) <math>\boxed{2} \sqrt{\boxed{30}}</math></p> <p>(2) <math>12\sqrt{2}</math></p> <p>(3) 21</p> <p>(4) <math>15\sqrt{3}</math></p> <p>(5) <math>5\sqrt{42}</math></p>	<p>(9) <math>\boxed{3} \boxed{3} \sqrt{10}</math></p> <p>(10) <math>3\sqrt{11}</math></p> <p>(11) <math>5\sqrt{3}</math></p> <p>(12) <math>3\sqrt{7}</math></p> <p>(13) <math>5\sqrt{7}</math></p> <p>(14) <math>7\sqrt{6}</math></p> <p>(15) <math>\boxed{3} 9</math></p> <p>(16) <math>10\sqrt{2}</math></p> <p>(17) <math>10\sqrt{3}</math></p> <p>(18) <math>6\sqrt{5}</math></p>

97	98	99	100
(1) $\boxed{6} 12$	(1) $\boxed{2} \boxed{3} 12$	(1) $\boxed{2} \boxed{3} \boxed{5} \sqrt{3}$	(1) $\boxed{14} \boxed{3}$ $\boxed{15} \sqrt{5}$
(2) $6\sqrt{5}$	(2) 20	(2) $\boxed{3} \boxed{2} \sqrt{3}$	(2) $3\sqrt{7}$
(3) $8\sqrt{3}$	(3) 24	(3) $3\sqrt{3}$	(3) $-\sqrt{2}$
(4) $4\sqrt{15}$	(4) $15\sqrt{2}$	(4) $2\sqrt{2}$	(4) $3\sqrt{5}$
(5) $4\sqrt{6}$	(5) $10\sqrt{6}$	(5) $3\sqrt{5}$	(5) $-7\sqrt{6}$
(6) $4\sqrt{7}$		(6) $\sqrt{7}$	
(7) $8\sqrt{3}$		(7) $\sqrt{2}$	
		(8) $-2\sqrt{7}$	
97	98	99	100
(8) $2\sqrt{30}$	(6) $16\sqrt{30}$	(9) $\boxed{6} \boxed{5} 11\sqrt{2}$	(6) $14\sqrt{2}$
(9) $5\sqrt{6}$	(7) 30	(10) $14\sqrt{3}$	(7) $14\sqrt{3}$
(10) $6\sqrt{5}$	(8) $14\sqrt{70}$	(11) $5\sqrt{2}$	(8) $-8\sqrt{5}$
(11) $8\sqrt{3}$		(12) $\sqrt{3}$	
(12) $12\sqrt{3}$		(13) $\sqrt{5}$	
(13) $18\sqrt{2}$	(9) $60\sqrt{3}$	(14) 0	(9) $-8\sqrt{5}$
		(15) $55\sqrt{3}$	
		(16) $-5\sqrt{6}$	
		(17) $-7\sqrt{10}$	
(14) 42	(10) $60\sqrt{2}$	(18) 0	(10) $-6\sqrt{6}$

# I 101-103

101	102	103
<p>(1) <math>\sqrt{10} + \sqrt{\boxed{6}}</math></p> <p>(2) <math>\sqrt{6} + \sqrt{3}</math></p> <p>(3) <math>\boxed{20} 2\sqrt{3} + 2\sqrt{5}</math></p> <p>(4) <math>3\sqrt{5} + 3\sqrt{6}</math></p> <p>(5) <math>6 + 4\sqrt{6}</math></p> <p>(6) <math>4 + \sqrt{6}</math></p>	<p><b>I</b></p> <p>(1) <math>\sqrt{35} + \sqrt{\boxed{21}} + \sqrt{\boxed{10}} + \sqrt{\boxed{6}}</math></p> <p>(2) <math>2\sqrt{3} + \sqrt{21} + 2 + \sqrt{7}</math></p> <p>(3) <math>\sqrt{6} + \sqrt{2} - \sqrt{15} - \sqrt{5}</math></p> <p>(4) <math>\sqrt{42} - \sqrt{14} - 5\sqrt{6} + 5\sqrt{2}</math></p> <p>(5) <math>\boxed{5}\sqrt{2} + \sqrt{15} + \boxed{2}\sqrt{5} + \sqrt{6}</math></p> <p>(6) <math>6\sqrt{3} + 6 + 3\sqrt{2} + \sqrt{6}</math></p>	<p><b>I</b></p> <p>(1) <math>\boxed{2} \boxed{9} - 2\sqrt{\boxed{14}}</math></p> <p>(2) <math>11 + 4\sqrt{7}</math></p> <p>(3) <math>7 - 4\sqrt{3}</math></p> <p>(4) <math>24 + 8\sqrt{5}</math></p> <p>(5) <math>49 - 12\sqrt{5}</math></p> <p>(6) <math>29 + 12\sqrt{5}</math></p> <p>(7) <math>\boxed{2} \boxed{8} + \boxed{4}\sqrt{3}</math></p> <p>(8) <math>24 - 12\sqrt{3}</math></p> <p>(9) <math>85 - 60\sqrt{2}</math></p>
101	102	103
<p>(7) <math>2\sqrt{3} + 2</math></p> <p>(8) <math>6\sqrt{2} - 6</math></p> <p>(9) <math>3\sqrt{2} - 3\sqrt{5}</math></p> <p>(10) <math>9 + \sqrt{3}</math></p> <p>(11) <math>2 + 3\sqrt{2}</math></p> <p>(12) <math>-3</math></p> <p>(13) <math>5\sqrt{2} + \sqrt{5}</math></p> <p>(14) <math>\sqrt{2} - 6</math></p>	<p><b>II</b></p> <p>(1) <math>\boxed{5} \boxed{9} - 4</math></p> <p>(2) <math>1</math></p> <p>(3) <math>6</math></p> <p>(4) <math>-1</math></p> <p>(5) <math>3</math></p> <p>(6) <math>11</math></p> <p>(7) <math>37</math></p> <p>(8) <math>10</math></p> <p>(9) <math>13</math></p>	<p><b>II</b></p> <p>(1) <math>19 + \boxed{7}\sqrt{7}</math></p> <p>(2) <math>-5 - \sqrt{7}</math></p> <p>(3) <math>5 + 3\sqrt{3}</math></p> <p>(4) <math>1 + \sqrt{3}</math></p> <p>(5) <math>29 + 10\sqrt{5}</math></p> <p>(6) <math>29 - 10\sqrt{5}</math></p> <p>(7) <math>-24 + 7\sqrt{6}</math></p> <p>(8) <math>36 - 13\sqrt{6}</math></p> <p>(9) <math>2 - 2\sqrt{10}</math></p>

104	105	106
<p><b>I</b></p> <p>(1) <math>\boxed{17} + \boxed{4}\sqrt{5}</math></p> <p>(2) <math>-5 - \sqrt{7}</math></p> <p>(3) <math>37 - 6\sqrt{5}</math></p> <p>(4) <math>-5 + 4\sqrt{3}</math></p> <p>(5) <math>-33 - 2\sqrt{35}</math></p> <p>(6) <math>43 - 18\sqrt{10}</math></p>	<p>(1) <math>\boxed{1} 3\sqrt{3} - 2\sqrt{6}</math></p> <p>(2) <math>39\sqrt{5} + 12\sqrt{15}</math></p> <p>(3) <math>7\sqrt{10} - 20</math></p> <p>(4) <math>17\sqrt{6} + 24\sqrt{3}</math></p>	<p>(1) <math>\sqrt{5}</math></p> <p>(2) <math>\boxed{6} \boxed{4} 2</math></p> <p>(3) 5</p> <p>(4) <math>\boxed{2} 2</math></p> <p>(5) <math>3\sqrt{2}</math></p>
104	105	106
<p><b>II</b></p> <p>(1) <math>\boxed{32} + \boxed{11}\sqrt{2}</math></p> <p>(2) <math>28 - \sqrt{2}</math></p> <p>(3) <math>26 + 16\sqrt{3}</math></p> <p>(4) <math>10 + 8\sqrt{3}</math></p> <p>(5) <math>54 + \sqrt{5}</math></p> <p>(6) <math>66 - 17\sqrt{5}</math></p>	<p>(5) 16</p> <p>(6) 76</p> <p>(7) <math>3 + 2\sqrt{2} - \sqrt{3} - \sqrt{6}</math></p> <p>(8) <math>-1 + \sqrt{2} + \sqrt{3}</math></p> <p>(9) <math>2\sqrt{2}</math></p>	<p>(6) <math>\frac{7}{3}</math></p> <p>(7) <math>\frac{3}{2}</math></p> <p>(8) <math>\boxed{8} \boxed{4} 6</math></p> <p>(9) <math>\boxed{120} \sqrt{6}</math></p> <p>(10) <math>5\sqrt{2}</math></p> <p>(11) <math>\boxed{18} \sqrt{6}</math></p> <p>(12) <math>\boxed{10} \frac{1}{2}</math></p> <p>(13) 2</p>

# I 107-110

107	108	109	110
(1) $\frac{\boxed{3}}{\boxed{3}} \frac{\sqrt{\boxed{3}}}{3}$	(1) $\boxed{2} \frac{\sqrt{10}}{5}$	(1) $\boxed{2} \boxed{2} \boxed{2} \sqrt{2}$	$\boxed{\text{I}}$ (1) $\frac{11\sqrt{2}}{2}$
(2) $\frac{2\sqrt{3}}{3}$	(2) $\frac{\sqrt{15}}{3}$	(2) $3\sqrt{3}$	(2) $2 - \sqrt{3}$
(3) $\frac{3\sqrt{5}}{5}$	(3) $\boxed{3} \frac{5\sqrt{2}}{6}$	(3) $\sqrt{2}$	(3) $\frac{5\sqrt{6}}{12}$
(4) $\frac{\sqrt{6}}{2}$	(4) $\frac{7\sqrt{3}}{18}$	(4) $\frac{4\sqrt{3}}{3}$	(4) $-\frac{\sqrt{5}}{10}$
(5) $\boxed{2} 2\sqrt{2}$	(5) $\frac{\sqrt{5}}{10}$	(5) $\frac{14\sqrt{3}}{3}$	
(6) $2\sqrt{5}$			
107	108	109	110
(7) $\frac{\boxed{2}}{\boxed{6}} \frac{\sqrt{3}}{3}$	(6) $\frac{\sqrt{6}}{6}$	(6) $-\frac{3\sqrt{6}}{2}$	$\boxed{\text{II}}$ (1) 6 $2\sqrt{3}$ 6
(8) $\sqrt{2}$	(7) $\frac{5\sqrt{3}}{6}$	(7) $-\frac{\sqrt{3}}{6}$	(2) $12\sqrt{3}$
(9) $2\sqrt{3}$	(8) $\boxed{4} \frac{5\sqrt{2}}{4}$	(8) $\frac{\sqrt{6}}{2}$	(3) 12
(10) $\frac{\sqrt{6}}{2}$	(9) $\sqrt{30}$	(9) $\frac{3\sqrt{5}}{10}$	(4) $\boxed{2} 24$
(11) $\frac{\sqrt{14}}{2}$	(10) $\frac{\sqrt{6}}{2}$	(10) $\frac{\sqrt{15}}{10}$	$\boxed{\text{III}}$ $3 - 4\sqrt{3}$
(12) $\sqrt{5}$			
(13) $\sqrt{2}$			
(14) $\sqrt{2}$			
(15) $\frac{\sqrt{6}}{2}$			
(16) $\frac{\sqrt{6}}{3}$			

111		112	
<b>I</b>		(1) $\boxed{2}$ $-5, \boxed{2}$	(5) $\boxed{4}$ $-4, \boxed{4}$
(1) $0, \boxed{5}$	(4) $\boxed{-4}, -2$	(2) $-3, -2$	(6) $-6, 6$
(2) $0, \boxed{8}$	(5) $\boxed{5}, \boxed{3}$	(3) $6, -1$	(7) $-8, 8$
(3) $\boxed{0}, \boxed{-12}$	(6) $\boxed{5}$	(4) $7, 5$	(8) $4$
111		112	
<b>II</b>		(9) $-8, 2$	(14) $\boxed{15}$ $\boxed{5}, \boxed{3}$ $-5, 3$
(1) $\boxed{5}$ $\boxed{5}, 2$	(7) $\boxed{6}$ $0, \boxed{6}$	(10) $8, -2$	(15) $6, -2$
(2) $-3, -1$	(8) $0, -1$	(11) $2, 1$	(16) $-7, 2$
(3) $-4, 2$	(9) $\boxed{5}$ $-5$	(12) $3, -2$	(17) $9, -2$
(4) $5, -3$	(10) $-2$	(13) $-9, 3$	(18) $-9, -4$
(5) $-6, 1$	(11) $0$		
(6) $-5, 3$	(12) $7$		

# I 113–116

113	114	115	116
(1) 0, 3	(1) $\frac{3}{2}$	(1) -7, 7	(1) $\boxed{2}$ $\boxed{\frac{2}{3}}, -1$
(2) $0, -\frac{1}{\boxed{3}}$	(2) $-\frac{5}{2}$	(2) $\frac{2}{3}$	(2) $-\frac{4}{3}, \frac{3}{2}$
(3) 3	(3) $\frac{3}{2}, -4$	(3) -15, 14	(3) 10, -4
(4) $\boxed{3}$ $-\frac{1}{\boxed{3}}$	(4) $-\frac{7}{2}, 1$	(4) 25, -24	(4) $0, -\frac{3}{2}$
(5) 7, -5			(5) 2, -1
(6) 18, -12			(6) 0, -3
113	114	115	116
(7) $\boxed{2}$ $-\frac{1}{\boxed{2}}, 1$	(5) $\frac{2}{3}, \frac{3}{2}$	(5) $\boxed{2}$ $\boxed{2}$ $-\frac{1}{2}, -2$	(7) -5, 5
(8) $\frac{2}{7}, -1$	(6) $\frac{6}{5}, -\frac{2}{3}$		(8) $-\frac{3}{2}, \frac{3}{2}$
(9) $-\frac{1}{3}, 5$	(7) $\frac{13}{7}, -\frac{5}{2}$	(6) $-\frac{3}{4}, 3$	(9) $0, \boxed{\frac{7}{2}}$
(10) $-\frac{3}{5}, \frac{1}{2}$			(10) $0, \frac{5}{7}$

117	118	119	120
(1) 6, 2	(1) $\boxed{4}$ 0, 4	(1) $\frac{1}{3}, -3$	(1) $\boxed{1}$ $\boxed{4}$ 4
(2) -1, 1	(2) $0, \frac{7}{3}$	(2) 4	
(3) 3, 2	(3) -2, 1	(3) 5	(2) 7, -1
(4) -1	(4) 2, 1	(4) -12, 12	(3) $4, \frac{1}{2}$
117	118	119	120
(5) 3, -1	(5) $\boxed{5}$ $\boxed{5}$ 0, -5	(5) $0, \frac{11}{2}$	(4) $\boxed{3a}$ $-3a, -2a$
(6) $-\frac{3}{4}, -4$	(6) -6, 4	(6) -6, -2	(5) $10a, -9a$
(7) $-\frac{3}{2}, -7$	(7) -2, 2	(7) $-\frac{13}{3}, 7$	(6) $-\frac{a}{2}, a$
	(8) $\frac{1}{2}, 2$		
	(9) $\frac{1}{2}, -1$		

# I 121-124

121	122	123	124
(1) $\pm \sqrt{\frac{7}{2}}$	(1) $\sqrt{5}$	(1) $\sqrt{1} \pm \sqrt{7}$	(1) $\sqrt{3} \pm 2\sqrt{3}$
(2) $\pm \frac{9}{2}$	$\sqrt{5}$ $\pm \sqrt{\frac{15}{3}}$	(2) $-3 \pm \sqrt{5}$	(2) $\sqrt{16}$
(3) $\pm \frac{1}{3}$	(2) $\pm \sqrt{\frac{35}{5}}$	(3) $5 \pm \sqrt{3}$	$\sqrt{11}$
(4) $\pm \frac{11}{2}$		(4) $8, \sqrt{-2}$	$\sqrt{11}$
(5) $\pm \frac{3}{2}$		(5) $10, 0$	$4 \pm \sqrt{11}$
(6) $\pm 2$		(6) $-1, -5$	
121	122	123	124
(7) $\pm 2$	(3) $\pm \frac{3\sqrt{2}}{2}$	(7) $4, \sqrt{-1}$	(3) $\sqrt{25}$
(8) $\pm \frac{5}{2}$	(4) $\pm \frac{9\sqrt{2}}{4}$	(8) $-1, -\frac{7}{3}$	$\sqrt{25}$
(9) $\pm \sqrt{\sqrt{5}}$	(5) $\pm \frac{\sqrt{7}}{7}$	(9) $-\frac{1}{2}, -\frac{5}{2}$	$\sqrt{16}$
(10) $\pm \sqrt{21}$	(6) $\pm \frac{\sqrt{2}}{4}$	(10) $\frac{3}{2}, -\frac{5}{2}$	$9, 1$
(11) $\pm \sqrt{2}$	(7) $\pm \frac{3\sqrt{2}}{4}$		(4) $\sqrt{25}$
(12) $\pm 3\sqrt{2}$	(8) $\pm \frac{3\sqrt{10}}{10}$		$\sqrt{5}$
(13) $\pm 3$			$-2, -8$
(14) $\pm 2\sqrt{10}$			(5) $\sqrt{4} \sqrt{4}$
(15) $\pm \sqrt{a}$			$\sqrt{2} \sqrt{4}$
(16) $\pm 3a$			$5, -1$
			(6) $\sqrt{4}$
			$4 \pm 2\sqrt{5}$

125	126	127	128
(1) $\boxed{1} \quad \boxed{1}$ $-1 \pm 2\sqrt{2}$ (2) 1, -3	(1) $\boxed{21}$ $\boxed{21}$ $\frac{\boxed{3} \pm \sqrt{\boxed{21}}}{2}$	(1) $\frac{\boxed{2}}{\boxed{5}} \quad \boxed{4}$ $\frac{2 \pm \sqrt{14}}{5}$	(1) $\boxed{64}$ $\frac{\boxed{33}}{\boxed{64}}$ $\frac{\sqrt{\boxed{33}}}{8}$ $\frac{-1 \pm \sqrt{33}}{8}$
(3) $3 \pm \sqrt{14}$ (4) 7, -1	(2) $\frac{\boxed{25}}{\boxed{4}}$ $\frac{-5 \pm \sqrt{33}}{2}$	(2) $\frac{-1 \pm \sqrt{10}}{3}$	(2) $\frac{-1 \pm \sqrt{5}}{8}$
125	126	127	128
(5) $\boxed{2} \quad \boxed{4}$ $-2 \pm \sqrt{7}$ (6) $-2 \pm \sqrt{2}$	(3) $\frac{\boxed{1}}{\boxed{2}} \quad \frac{\boxed{1}}{\boxed{4}}$ 2, -3 (4) 1, -6	(3) $\frac{-1 \pm 2\sqrt{7}}{3}$ (4) $\frac{-1 \pm \sqrt{51}}{5}$	(3) $\frac{-3 \pm \sqrt{41}}{4}$ (4) $2, -\frac{7}{2}$
(7) $5 \pm \sqrt{17}$	(5) $\frac{7 \pm \sqrt{17}}{2}$		(5) $\frac{-3 \pm \sqrt{41}}{8}$

# I 129-131

129	130	131
<p>(1) <math>\boxed{16}</math></p> <p><math>\frac{\boxed{17}}{\boxed{16}}</math></p> <p><math>\frac{\sqrt{\boxed{17}}}{\boxed{4}}</math></p> <p><math>\frac{3 \pm \sqrt{17}}{4}</math></p> <p>(2) <math>\frac{-5 \pm \sqrt{61}}{6}</math></p>	<p>(1) <math>\frac{1}{2}, -\frac{3}{2}</math></p> <p>(2) <math>2, \frac{1}{3}</math></p>	<p>(1) <math>\frac{\boxed{-9} \quad \boxed{2}}{\boxed{3}}</math></p> <p><math>\frac{9 \pm \sqrt{57}}{6}</math></p> <p>(2) <math>\frac{9 \pm \sqrt{105}}{6}</math></p>
129	130	131
<p>(3) <math>\frac{\boxed{25}}{\boxed{36}}</math></p> <p><math>\frac{\boxed{1}}{\boxed{36}}</math></p> <p><math>\frac{\boxed{1}}{\boxed{6}}</math></p> <p><math>1, \frac{2}{3}</math></p> <p>(4) <math>\frac{8}{3}, -1</math></p>	<p>(3) <math>\frac{7 \pm \sqrt{37}}{6}</math></p> <p>(4) <math>\boxed{b^2}</math></p> <p><math>\boxed{b^2}</math></p> <p><math>\boxed{b^2} \quad \boxed{4ac}</math></p> <p><math>\boxed{b^2} \quad \boxed{4ac}</math></p>	<p>(3) <math>\frac{\boxed{7} \quad \boxed{1}}{\boxed{2}}</math></p> <p><math>\frac{-7 \pm \sqrt{41}}{4}</math></p> <p>(4) <math>\frac{7 \pm \sqrt{57}}{4}</math></p>
<p>(5) <math>\boxed{a^2}</math></p> <p><math>\boxed{a^2}</math></p> <p><math>\boxed{a^2}</math></p> <p><math>-\boxed{a} \pm \sqrt{\boxed{a^2} + b}</math></p>	<p><math>-\frac{\boxed{b} \pm \sqrt{\boxed{b^2} - \boxed{4ac}}}{2a}</math></p>	<p>(5) <math>\frac{-5 \pm \sqrt{33}}{4}</math></p>

132	133	134
(1) $\boxed{-1}$ $\frac{-7 \pm \sqrt{57}}{4}$  (2) $\frac{7 \pm \sqrt{41}}{4}$	(1) $\boxed{-8}$ $1, -\frac{8}{3}$  (2) $\frac{8}{3}, -1$  (3) $-\frac{1}{2}, -3$  (4) $-1, -\frac{3}{2}$	(1) $\frac{-7 \pm \sqrt{73}}{4}$  (2) $-\frac{1}{2}, -3$  (3) $2, \frac{1}{2}$  (4) $\frac{-7 \pm \sqrt{109}}{6}$
132	133	134
(3) $\frac{9 \pm \sqrt{33}}{8}$  (4) $\frac{-9 \pm \sqrt{33}}{8}$  (5) $\boxed{2}$ $\boxed{25}$ $\boxed{5}$ $\boxed{-2}, \boxed{-\frac{1}{3}}$  (6) $2, \frac{1}{3}$	(5) $\frac{3}{2}, 1$  (6) $2, \frac{1}{4}$  (7) $\frac{3}{4}, -1$	(5) $\frac{-5 \pm \sqrt{13}}{6}$  (6) $-\frac{2}{3}, -1$  (7) $\frac{2}{3}, \frac{1}{4}$

# I 135–137

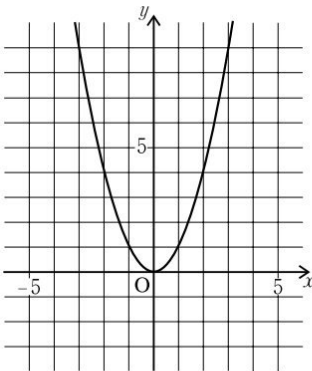
135	136	137
(1) $\boxed{1}$ $\boxed{22}$ $\frac{-5 \pm \sqrt{\boxed{22}}}{3}$ (2) $-1, -\frac{5}{2}$	(1) $\boxed{4}$ $4, -2$ (2) $\frac{5 \pm \sqrt{109}}{6}$ (3) $-1$	(1) $\frac{-5 \pm \sqrt{109}}{6}$ (2) $\frac{15 \pm \sqrt{5}}{10}$ (3) $-\frac{2}{3}, -2$
(3) $3, \frac{1}{3}$ (4) $5, -\frac{1}{3}$	(4) $2 \pm \sqrt{3}$	(4) $\frac{1}{3}, -3$
135	136	137
(5) $-3 \pm \sqrt{13}$ (6) $-4 \pm \sqrt{19}$	(5) $\pm 2$ (6) $-1, -\frac{5}{4}$	(5) $1, -\frac{9}{2}$ (6) $2 \pm \sqrt{10}$
(7) $\frac{2}{3}$	(7) $\frac{3 \pm \sqrt{29}}{5}$ (8) $\frac{1 \pm \sqrt{5}}{2}$	(7) $0, -\frac{5}{2}$ (8) $6, 2$

138	139	140
(1) $-7, -8$  (2) $14, -8$	(1) $\boxed{24}$ $3, -2$ $(x-3)(x+\boxed{2})=0$	(1) $-\frac{2}{3}, -\frac{3}{2}$ $(3x+2)(2x+3)=0$
(3) $5 \pm \sqrt{37}$  (4) $-\frac{1}{2}, -3$	(2) $\frac{3}{2}, -1$ $(2x-3)(x+1)=0$	(2) $\frac{1}{3}, -\frac{2}{5}$ $(5x+2)(3x-1)=0$
138	139	140
(5) $\frac{1 \pm \sqrt{7}}{3}$  (6) $-\frac{1}{3}, -\frac{3}{5}$	(3) $5, 2$ $(x-5)(x-2)=0$  (4) $-1, -\frac{4}{3}$ $(3x+4)(x+1)=0$	(3) $\frac{4}{5}, -\frac{7}{3}$ $(5x-4)(3x+7)=0$

(No exercises)

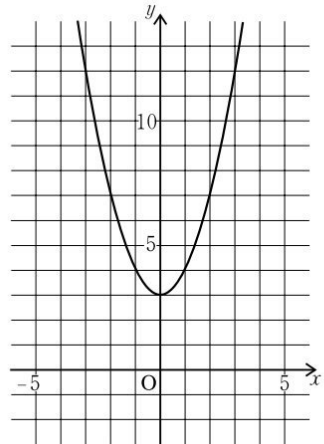
(1)

$y$
9
4
1
$\frac{1}{4}$
0
$\frac{1}{4}$
1
4
9



(2)

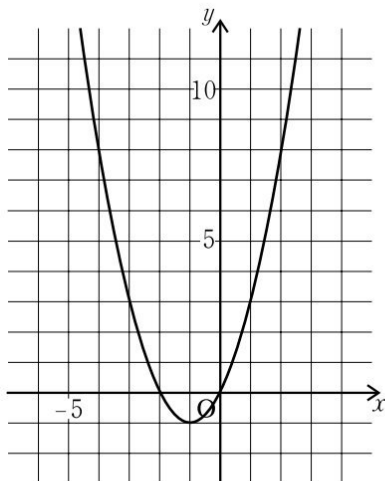
$y$
12
7
4
$\frac{13}{4}$
3
$\frac{13}{4}$
4
7
12



142

(1)

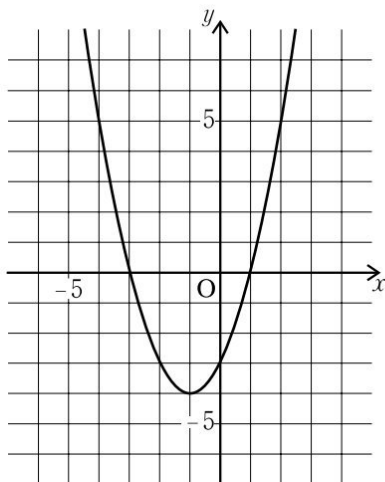
$y$
8
3
0
$-\frac{3}{4}$
-1
$-\frac{3}{4}$
0
3
8



142

(2)

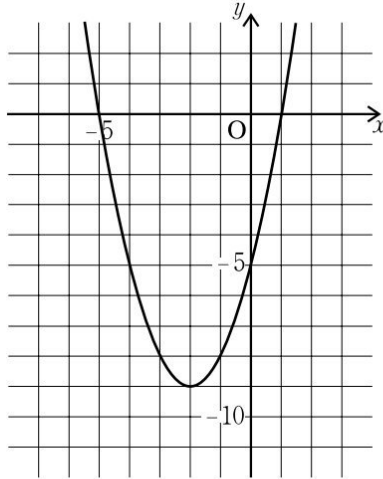
$y$
5
0
-3
$-\frac{15}{4}$
-4
$-\frac{15}{4}$
-3
0
5



143

(1)

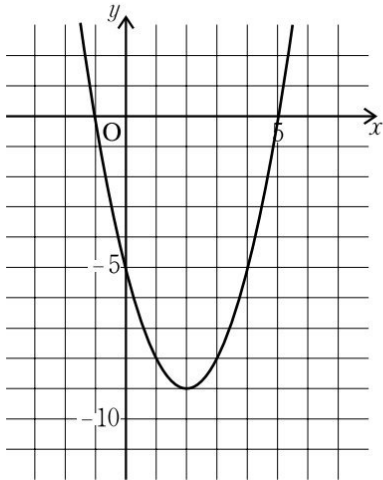
$y$
0
-5
-8
$-\frac{35}{4}$
-9
$-\frac{35}{4}$
-8
-5
0



143

(2)

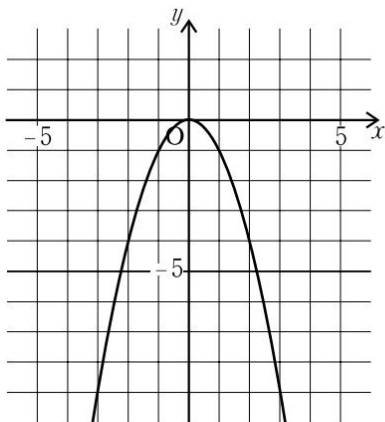
$y$
0
-5
-8
$-\frac{35}{4}$
-9
$-\frac{35}{4}$
-8
-5
0



144

(1)

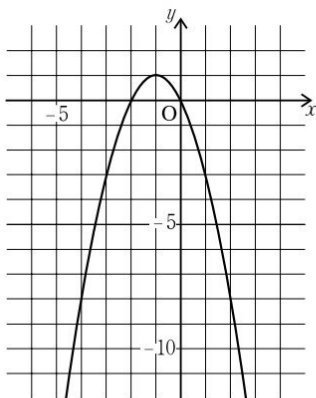
$y$
-9
-4
-1
0
-1
-4
-9



144

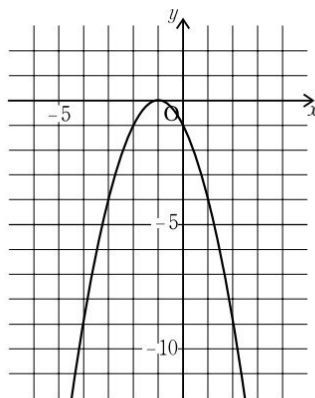
(2)

$y$
-8
-3
0
1
0
-3
-8



(3)

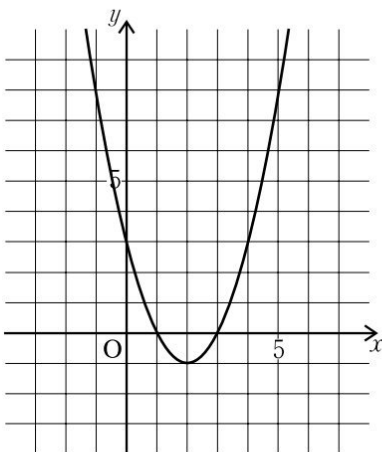
$y$
-9
-4
-1
0
-1
-4
-9



145

(1)

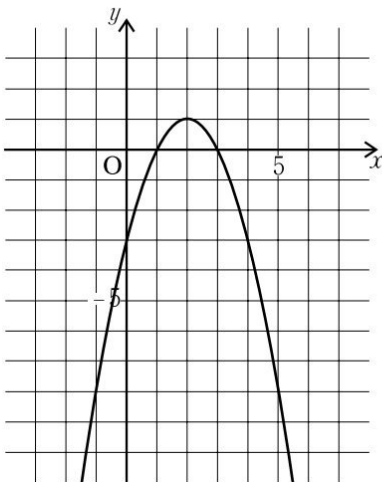
$y$
8
3
0
-1
0
3
8



145

(2)

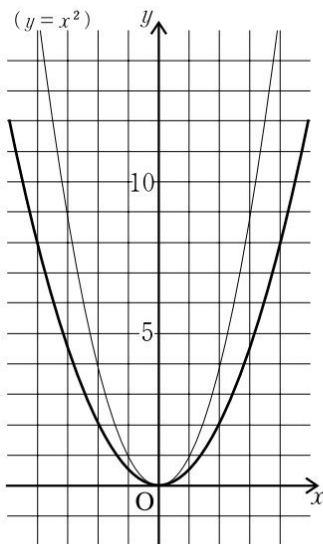
$y$
-8
-3
0
1
0
-3
-8



146

(1)

$y$
8
$\frac{9}{2}$
2
$\frac{1}{2}$
0
$\frac{1}{2}$
2
$\frac{9}{2}$
8



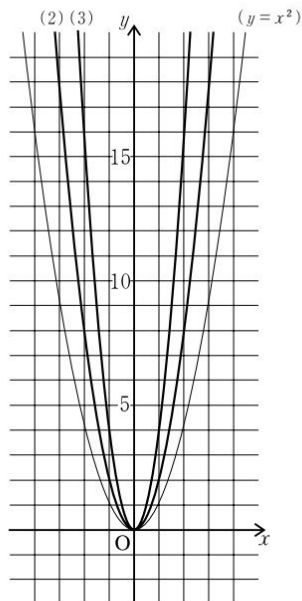
146

(2)

$y$
18
8
2
0
2
8
18

(3)

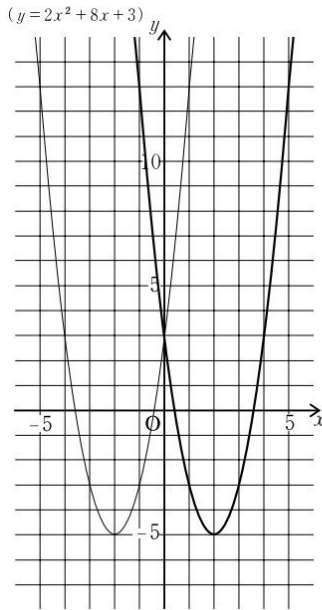
$y$
36
16
4
0
4
16
36



147

I

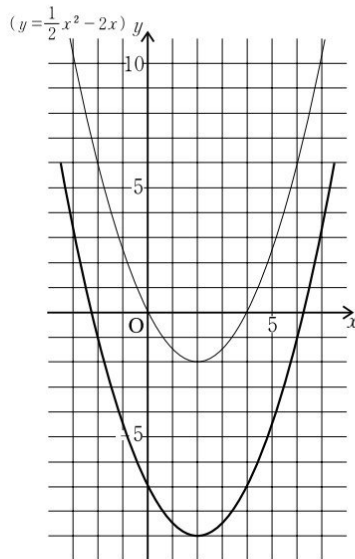
$y$
13
3
-3
-5
-3
3
13



147

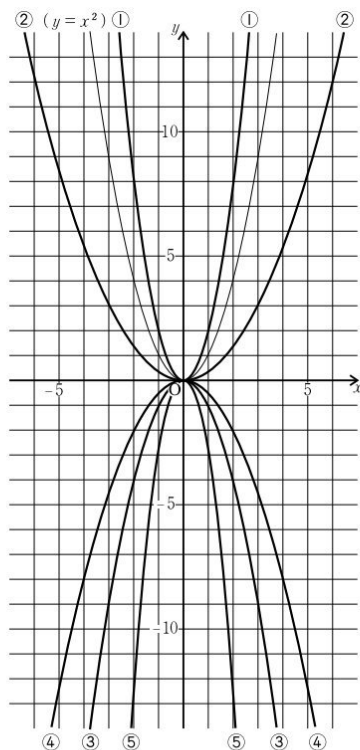
II

$y$
-1
$-\frac{9}{2}$
-7
$-\frac{17}{2}$
-9
$-\frac{17}{2}$
-7
$-\frac{9}{2}$
-1



148

I



148

II

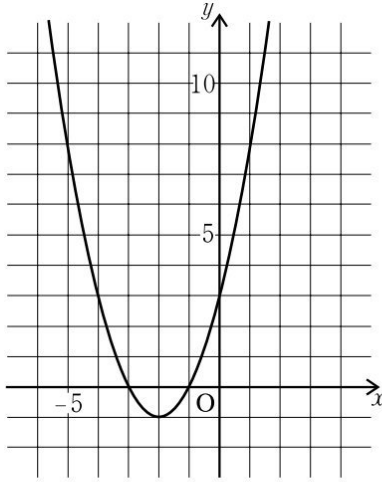
- (1)
- (2)
- (3)
- (4)
- (5)
- (6)
- (7)
- (8)

149

(1)

①

$y$
8
3
0
-1
0
3
8

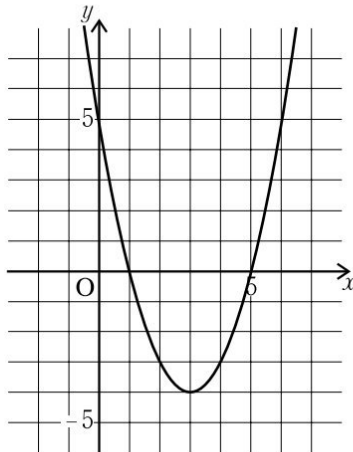
②  $(0, \boxed{3})$ 

149

(2)

①

$y$
5
0
-3
-4
-3
0
5

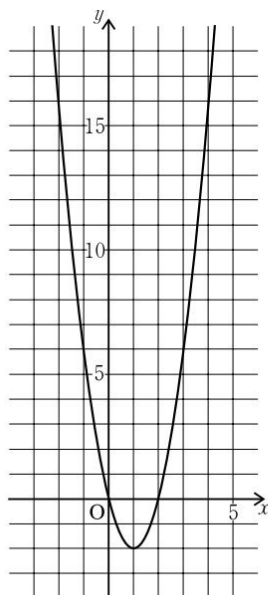
②  $(0, \boxed{5})$

150

(1)

①

$y$
16
6
0
-2
0
6
16

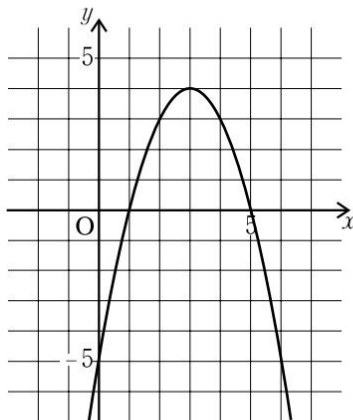
②  $(0, \boxed{0})$ ③  $(1, \boxed{-2})$ 

150

(2)

①

$y$
-5
0
3
4
3
0
-5

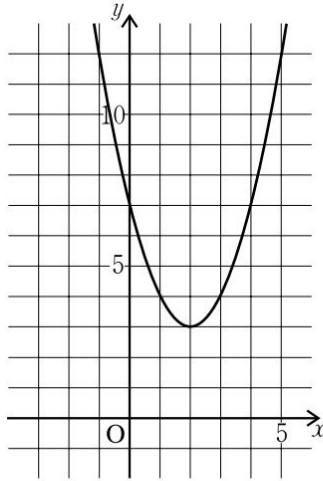
②  $(\boxed{0}, \boxed{-5})$ ③  $(\boxed{3}, \boxed{4})$

## 151

I

①

$y$
12
7
4
3
4
7
12

②  $(2, \boxed{3})$ 

## 151

II

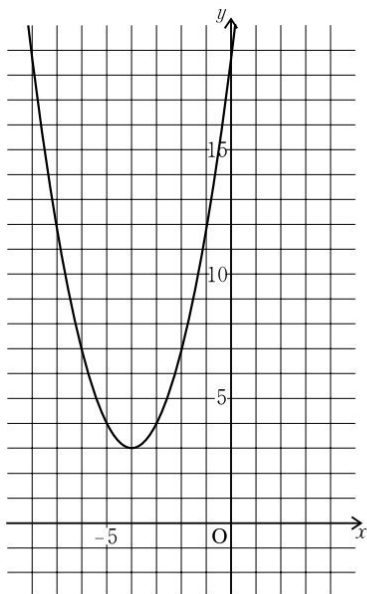
(1)  $(\boxed{2}, 5)$ (2)  $(2, -5)$ (3)  $(3, 1)$ (4)  $(5, 4)$ (5)  $(9, 7)$ (6)  $(1, -4)$ (7)  $(6, -9)$ (8)  $(8, -5)$ (9)  $(7, -10)$ (10)  $(2, \frac{1}{2})$ (11)  $(\frac{1}{5}, -1)$ (12)  $(\frac{1}{3}, -\frac{3}{2})$

## 152

I

①

$y$
19
12
7
4
3
4
7
12
19
28

②  $(-4, 3)$ 

## 152

II

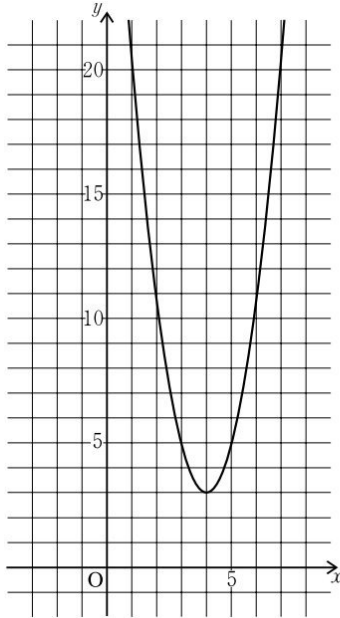
- (1)  $(-1, 2)$
- (2)  $(1, 5)$
- (3)  $(-4, 6)$
- (4)  $(5, 8)$
- (5)  $(-8, -1)$
- (6)  $(-6, 7)$
- (7)  $(9, -4)$
- (8)  $(-2, 0)$
- (9)  $(-1, -\frac{1}{2})$
- (10)  $(-\frac{3}{2}, 4)$
- (11)  $(-\frac{1}{6}, 0)$
- (12)  $(\frac{1}{4}, -\frac{2}{3})$

## 153

I

①

$y$
35
21
11
5
3
5
11
21

②  $(\boxed{4}, 3)$ 

## 153

II

- (1)  $(\boxed{-3}, 2)$
- (2)  $(3, -2)$
- (3)  $(-3, 2)$
- (4)  $(3, 2)$
- (5)  $(3, \boxed{2})$
- (6)  $(3, 2)$
- (7)  $(-3, 0)$
- (8)  $(0, -5)$
- (9)  $(0, 0)$
- (10)  $(0, 3)$
- (11)  $(-3, -\frac{1}{4})$
- (12)  $(\frac{1}{5}, -\frac{1}{12})$

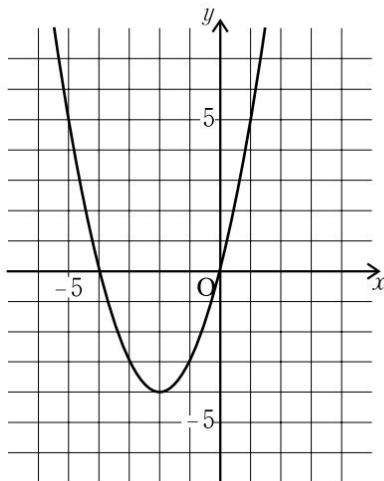
154

I

①  $(-2, \text{$ )

②

$y$
5
0
-3
-4
-3
0
5



154

II

(1)  $(2, \text{$ )(2)   $(4, -16)$ (3)  $(-5, -25)$ (4)  $(-1, -1)$

155

I

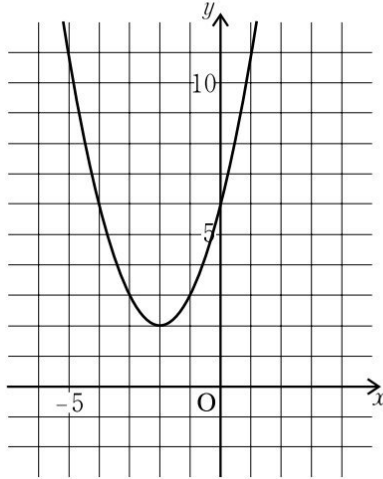
①  $\boxed{4}$

$\boxed{2}$

$(-2, \boxed{2})$

②

$y$
11
6
3
2
3
6
11



155

II

(1)  $\boxed{9}$

$\boxed{2}$

$(3, \boxed{-2})$

(2)  $\boxed{4}$   $\boxed{16}$

$\boxed{4}$   $\boxed{19}$

$(4, -19)$

(3)  $(-5, -24)$

(4)  $(-1, -11)$

156	157
<p>(1) <math>\boxed{9}</math></p> <p><math>\boxed{17}</math></p> <p><math>\left(-\frac{3}{2}, -\frac{\boxed{17}}{4}\right)</math></p> <p>(2) <math>\boxed{2}</math> <math>\boxed{4}</math></p> <p><math>\boxed{2}</math> <math>\boxed{41}</math></p> <p><math>\boxed{4}</math></p> <p><math>\left(\frac{7}{\boxed{2}}, -\frac{\boxed{41}}{\boxed{4}}\right)</math></p>	<p>(1) <math>\boxed{1}</math></p> <p><math>\boxed{1}</math></p> <p><math>\boxed{7}</math></p> <p><math>(-1, \boxed{-7})</math></p> <p>(2) <math>y = 2(x+1)^2 - 9</math></p> <p><math>(-1, -9)</math></p>
156	157
<p>(3) <math>y = \left(x + \frac{5}{2}\right)^2 - \frac{17}{4}</math></p> <p><math>\left(-\frac{5}{2}, -\frac{17}{4}\right)</math></p> <p>(4) <math>y = \left(x - \frac{7}{2}\right)^2 - \frac{53}{4}</math></p> <p><math>\left(\frac{7}{2}, -\frac{53}{4}\right)</math></p>	<p>(3) <math>y = 2(x+1)^2 - 5</math></p> <p><math>(-1, -5)</math></p> <p>(4) <math>y = 2(x+2)^2 - 10</math></p> <p><math>(-2, -10)</math></p>
<p>(5) <math>y = \left(x + \frac{1}{2}\right)^2 - \frac{21}{4}</math></p> <p><math>\left(-\frac{1}{2}, -\frac{21}{4}\right)</math></p> <p>(6) <math>y = \left(x - \frac{1}{2}\right)^2 + \frac{23}{4}</math></p> <p><math>\left(\frac{1}{2}, \frac{23}{4}\right)</math></p>	<p>(5) <math>y = 3(x-3)^2 - 38</math></p> <p><math>(3, -38)</math></p>

# I 158–159

158	159
<p>(1) <math>\boxed{49}</math></p> <p><math>\boxed{49}</math></p> <p><math>\boxed{11}</math></p> <p><math>\left(-\frac{7}{6}, \frac{\boxed{11}}{12}\right)</math></p> <p>(2) <math>y = 3\left(x + \frac{4}{3}\right)^2 - \frac{1}{3}</math></p> <p><math>\left(-\frac{4}{3}, -\frac{1}{3}\right)</math></p>	<p>(1) <math>\boxed{9}</math></p> <p><math>\boxed{9}</math></p> <p><math>\boxed{13}</math></p> <p><math>(-3, \boxed{13})</math></p> <p>(2) <math>y = -2(x+1)^2 + 5</math></p> <p><math>(-1, 5)</math></p>
158	159
<p>(3) <math>y = 3\left(x + \frac{4}{3}\right)^2 - \frac{19}{3}</math></p> <p><math>\left(-\frac{4}{3}, -\frac{19}{3}\right)</math></p> <p>(4) <math>y = 3\left(x - \frac{5}{6}\right)^2 - \frac{1}{12}</math></p> <p><math>\left(\frac{5}{6}, -\frac{1}{12}\right)</math></p>	<p>(3) <math>\frac{\boxed{25}}{\boxed{36}}</math></p> <p><math>y = -3\left(x - \frac{5}{6}\right)^2 + \frac{1}{12}</math></p> <p><math>\left(\frac{5}{6}, \frac{1}{12}\right)</math></p> <p>(4) <math>y = -4\left(x - \frac{3}{4}\right)^2 + \frac{13}{4}</math></p>
<p>(5) <math>y = 3\left(x + \frac{1}{3}\right)^2 + \frac{2}{3}</math></p> <p><math>\left(-\frac{1}{3}, \frac{2}{3}\right)</math></p>	<p><math>\left(\frac{3}{4}, \frac{13}{4}\right)</math></p>

160	161
(1) (0, 0) (2) (0, 3) (3) (0, 0)	$\boxed{\text{I}}$ [Sol] $\boxed{0} = x^2 - 2x - 3$ $x = 3, -1$ $(\boxed{3}, 0), (\boxed{-1}, 0)$
(4) (0, -2) (5) (0, 3) (6) $y = (x-3)^2 + 1$ (3, 1)	
160	161
(7) $\boxed{2}$ $\boxed{4}$ $y = \frac{3}{4}(x-2)^2 - 3$ (2, -3) (8) $y = \frac{1}{2}(x+2)^2 + 1$ (-2, 1)	$\boxed{\text{II}}$ (1) [Sol] $0 = -x^2 + 6x - 5$ $x = 1, 5$ $(1, 0), (5, 0)$ (2) ① [Sol] $y = (\boxed{-5})^2 + 4 \times (\boxed{-5}) + 3$ $= 8$ $(-5, \boxed{8})$ ② (0, 3)

## 162

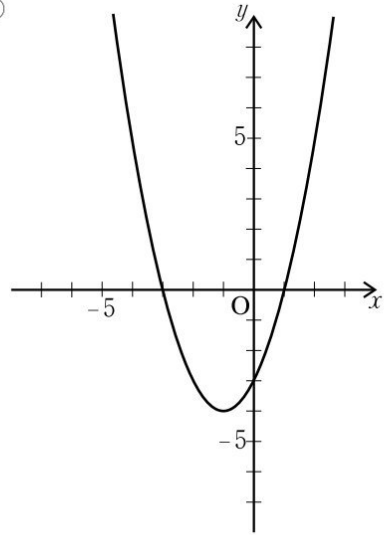
(1)

① [Sol]  $y = (x + 1)^2 - 4$  ④

$(-1, -4)$

②  $(0, -3)$

③  $(-3, 0), (1, 0)$



## 162

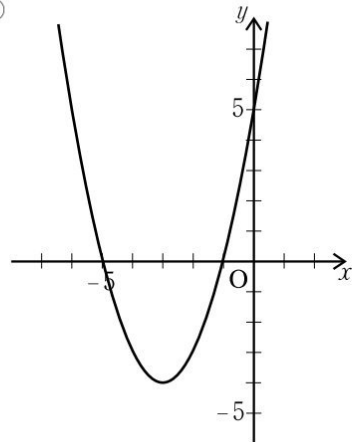
(2)

① [Sol]  $y = (x + 3)^2 - 4$  ④

$(-3, -4)$

②  $(0, 5)$

③  $(-5, 0), (-1, 0)$



## 163

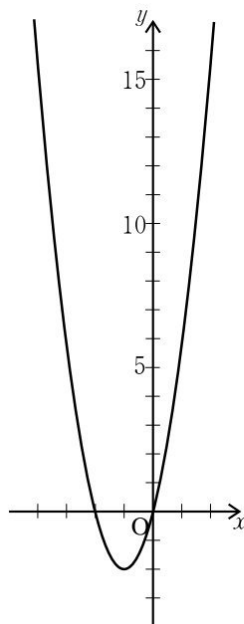
(1)

① [Sol]  $y = 2(x+1)^2 - 2$  ④

$(-1, -2)$

②  $(0, 0)$

③  $(0, 0), (-2, 0)$



## 163

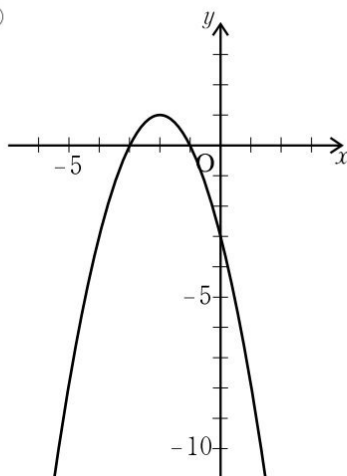
(2)

① [Sol]  $y = -(x+2)^2 + 1$  ④

$(-2, 1)$

②  $(0, -3)$

③  $(-3, 0), (-1, 0)$



## 164

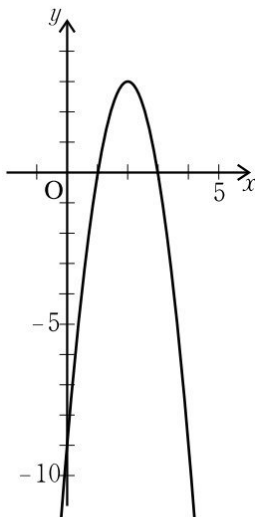
(1)

① [Sol]  $y = -3(x-2)^2 + 3$  ④

$(2, 3)$

②  $(0, -9)$

③  $(3, 0), (1, 0)$



## 164

(2)

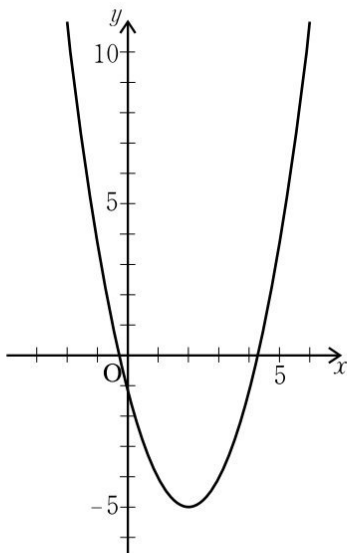
① [Sol]  $y = (x-2)^2 - 5$  ④

$(2, -5)$

②  $(0, -1)$

③  $(2 + \sqrt{5}, 0)$

$(2 - \sqrt{5}, 0)$



## 165

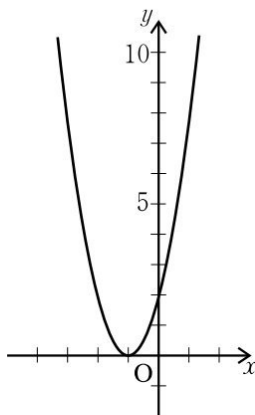
I

① [Sol]  $y = 2(x + 1)^2$  ④

$(-1, 0)$

②  $(0, 2)$

③  $(-1, 0)$



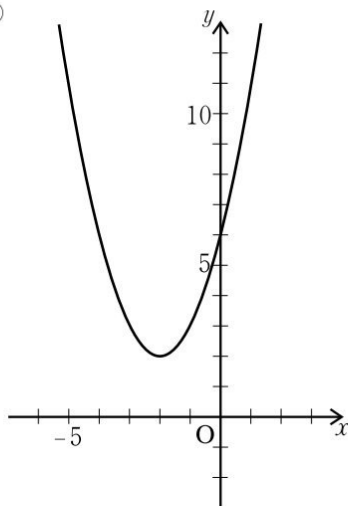
## 165

II

① [Sol]  $y = (x + 2)^2 + 2$  ③

$(-2, 2)$

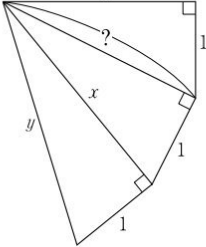
②  $(0, 6)$





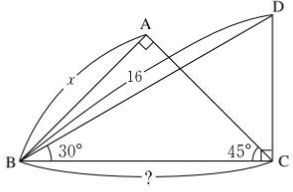
169	170	171
(1) $\left(\frac{5+\sqrt{13}}{2}, 0\right),$ $\left(\frac{5-\sqrt{13}}{2}, 0\right)$	(1) $(\sqrt{2}, 0)$	<div style="border: 1px solid black; padding: 2px; display: inline-block;">I</div> (1) $A = \frac{1}{2} \times 4 \times \boxed{3}$ $= \boxed{6}$ (2) 24 (3) 54 (4) $\frac{1}{2}bc$ (5) $\frac{1}{2}(a-b)c$ (6) $\frac{1}{2}ch$
169	170	171
(2) $(3+\sqrt{6}, 9+3\sqrt{6}),$ $(3-\sqrt{6}, 9-3\sqrt{6})$	(2) $\left(\frac{1+\sqrt{13}}{2}, \frac{7+\sqrt{13}}{2}\right),$ $\left(\frac{1-\sqrt{13}}{2}, \frac{7-\sqrt{13}}{2}\right)$  (3) $(a, 0), (b, b^2-ab)$	<div style="border: 1px solid black; padding: 2px; display: inline-block;">II</div> (1) $\boxed{60}^\circ$ (2) $30^\circ$ (3) $60^\circ$ (4) $30^\circ$ (5) $45^\circ$ (6) $90^\circ$ (7) $60^\circ$ (8) $\boxed{45}$ $15^\circ$

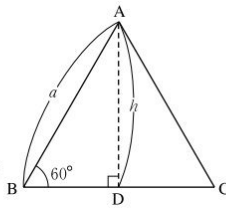
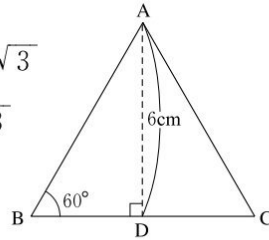
# I 172-174

172	173	174
<p>(1)</p> <p>① <math>c^2 = d^2 + \boxed{e^2}</math></p> <p>② <math>\boxed{b^2} = a^2 + e^2</math></p> <p>③ <math>(a+d)^2 = \boxed{b^2} + \boxed{c^2}</math></p>	<p>(1)</p> <p>[Sol]</p> $x^2 = 5^2 + \boxed{12}^2 = \boxed{169}$ $x = \boxed{13}$	<p>(1) <math>\begin{cases} x = \sqrt{21} \\ y = 2\sqrt{3} \end{cases}</math></p>
172	173	174
<p>(2)</p> $(a+b)^2 = \boxed{c^2} + \frac{1}{2}ab \times 4$ $a^2 + 2ab + b^2 = \boxed{c^2} + \boxed{2}ab$ $\boxed{c^2} = a^2 + b^2$	<p>(2) 20</p> <p>(3) <math>\sqrt{61}</math></p> <p>(4) 12</p> <p>(5) 17</p>	<p>(2) <math>\begin{cases} x = 2\sqrt{10} \\ y = \sqrt{15} \end{cases}</math></p> <p>(3) <math>\begin{cases} x = \sqrt{6} \\ y = \sqrt{7} \end{cases}</math> (for reference)</p>  <p>First find the length of the hypotenuse of the right triangle with the sides whose lengths are 1 and 2.</p>

175	176	177
<p>(1)</p> <p>[Sol] <math>5^2 = x^2 + \boxed{4}^2</math></p> $x^2 = 9$ $x = 3$	<p>(1)</p> <p>[Sol] <math>x^2 = 6^2 + \boxed{3}^2 = \boxed{45}</math></p> $x = 3\sqrt{5}$	<p>(1)</p> <p>[Sol]</p> $x^2 = (b-a)^2 + \boxed{c^2}$ $= a^2 + b^2 + \boxed{c^2} - 2ab$ $x = \sqrt{a^2 + b^2 + \boxed{c^2} - 2ab}$ <p>(2) <math>\sqrt{c^2 - a^2 - b^2 + 2ab}</math></p>
175	176	177
<p>(2) <math>\sqrt{55}</math></p> <p>(3) <math>2\sqrt{5}</math></p> <p>(4) <math>5\sqrt{3}</math></p> <p>(5) <math>3\sqrt{2}</math></p>	<p>(2) <math>3\sqrt{3}</math></p>   <p>(3) <math>7 - \sqrt{11}</math></p>	<p>(3) <math>\sqrt{a^2 + b^2 + c^2 + 2ab}</math></p>

# I 178–180

178	179	180
<p>(1)</p> <p>[Sol] <math>x = \boxed{2}</math></p> $\boxed{2}^2 = y^2 + 1^2$ $y^2 = \boxed{3}$ $y = \sqrt{3}$ $\begin{cases} x = 2 \\ y = \sqrt{3} \end{cases}$	<p><b>I</b></p> <p>(1) ① <math>2 : \boxed{1}</math></p> <p>② <math>\boxed{10}</math></p> $\boxed{2} : 1$ <p>(2) ① <math>\frac{2}{\boxed{3}}</math></p> <p>② <math>\boxed{6} \frac{3}{5}</math></p> <p>③ <math>\frac{1}{6}</math></p> <p>④ <math>\frac{\boxed{5}}{1}</math></p> <p>⑤ <math>\frac{9}{1}</math></p> <p>⑥ <math>\frac{8}{3}</math></p>	<p>(1)</p> <p>[Sol] <math>2x = \boxed{20\sqrt{3}}</math></p> $x = 10\sqrt{3}$ $\sqrt{2}y = \boxed{20}$ $y = 10\sqrt{2}$ $\begin{cases} x = 10\sqrt{3} \\ y = 10\sqrt{2} \end{cases}$
178	179	180
<p>(2)</p> <p>[Sol] <math>x = \boxed{2}y</math></p> $(\boxed{2}y)^2 = y^2 + 6^2$ $\boxed{3}y^2 = 36$ $y^2 = \boxed{12}$ $y = 2\sqrt{3}$ $x = 4\sqrt{3}$ $\begin{cases} x = 4\sqrt{3} \\ y = 2\sqrt{3} \end{cases}$ <p>(3) <math>10\sqrt{2}</math></p>	<p><b>II</b></p> <p>(1) <math>\boxed{20}</math></p> <p>10</p> <p>(2) <math>\boxed{2}</math> <math>\boxed{72}</math></p> <p>36</p> <p>(3) <math>\frac{39}{5}</math></p> <hr style="border-top: 1px dashed black;"/> <p>(4) <math>3\sqrt{2}</math></p> <p>(5) <math>\frac{2\sqrt{6}}{3}</math></p> <p>(6) <math>5\sqrt{2}</math></p>	<p>(2) <math>\begin{cases} x = 5\sqrt{3} \\ y = 15 \end{cases}</math></p> <p>(3) <math>x = 4\sqrt{6}</math></p> <p>(for reference)</p>  <p>First find the length of BC.</p>

181	182
<p>(1)</p> <p>① [Sol] <math>2h = \boxed{6\sqrt{3}}</math></p> $h = 3\sqrt{3}$ $\underline{3\sqrt{3} \text{ cm}}$ <p>② [Sol] <math>\text{Area} = \frac{1}{2} \times \boxed{6} \times \boxed{3\sqrt{3}}</math></p> $= \boxed{9\sqrt{3}}$ $\underline{9\sqrt{3} \text{ cm}^2}$	<p>(1) [Sol] (for reference)</p> $a : h = 2 : \sqrt{3}$ $h = \frac{\sqrt{3}}{2} a$ $\text{Area} = \frac{1}{2} \times a \times \frac{\sqrt{3}}{2} a$ $= \frac{\sqrt{3}}{4} a^2$  $\underline{\frac{\sqrt{3}}{4} a^2}$ <p>(2) [Sol]</p> <p>First make an equation using the result of the preceding exercise (1), and then solve it.</p> $\frac{\sqrt{3}}{4} a^2 = \sqrt{3}$ $a^2 = 4$ $a = 2$ $\underline{2 \text{ cm}}$
181	182
<p>(2) (for reference)</p> <p>① [Sol]</p> $AB : AD = 2 : \sqrt{3}$ $AB : 6 = 2 : \sqrt{3}$ $AB = 4\sqrt{3}$  $\underline{4\sqrt{3} \text{ cm}}$ <p>② <math>\underline{12\sqrt{3} \text{ cm}^2}</math></p>	<p>(3) <math>\underline{\frac{3\sqrt{3}}{2} \text{ cm}^2}</math></p>

# I 183–184

## 183

(1)

① [Sol]  $a : h = \sqrt{2} : 1$

$$h = \frac{\sqrt{2}}{2} a$$

$$\frac{\sqrt{2}}{2} a$$

②

$$\frac{\sqrt{2}}{4} a^2$$

## 184

(1) [Sol]

$$AO : AC = \sqrt{2} : 1$$

$$r : AC = \sqrt{2} : 1$$

$$AC = \frac{\sqrt{2}}{2} r$$

The area of the triangle ABO is

$$\frac{1}{2} \times r \times \frac{\sqrt{2}}{2} r = \frac{\sqrt{2}}{4} r^2.$$

The area of the octagon is

$$\frac{\sqrt{2}}{4} r^2 \times 8 = 2\sqrt{2} r^2.$$

$$2\sqrt{2} r^2$$

## 183

(2)

① [Sol]

$$AC : DC = 2 : \sqrt{3}$$

$$4 : DC = 2 : \sqrt{3}$$

$$DC = 2\sqrt{3}$$

$$DB = AB - AD = 4$$

$$BC^2 = DC^2 + DB^2$$

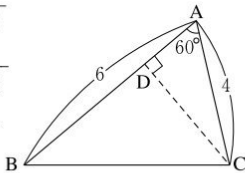
$$BC = 2\sqrt{7}$$

$$2\sqrt{7} \text{ cm}$$

②

$$6\sqrt{3} \text{ cm}^2$$

(for reference)



## 184

(2) [Sol]

$$y : a = 1 : \sqrt{2}$$

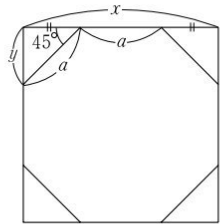
$$y = \frac{\sqrt{2}}{2} a$$

$$x = a + 2y$$

$$= a + \sqrt{2} a$$

$$(a + \sqrt{2} a) \text{ cm}$$

(for reference)





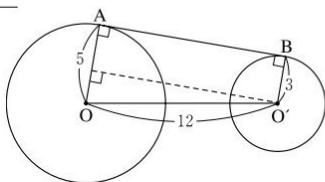
# I 187-188

## 187

(1)

①  $\underline{2\sqrt{35}}$

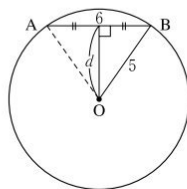
(for reference)



## 188

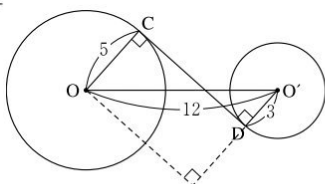
(1)  $\underline{4 \text{ cm}}$

(for reference)



②  $\underline{4\sqrt{5}}$

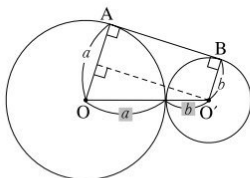
(for reference)



## 187

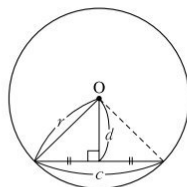
(2)  $\underline{2\sqrt{ab}}$

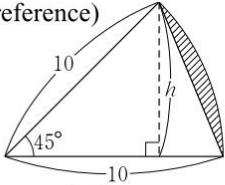
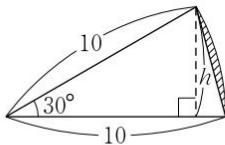
(for reference)



## 188

(2)  $\underline{2\sqrt{r^2 - d^2}}$  (for reference)



189	190
<p><b>I</b></p> <p>(1) ① <math>\boxed{12} \pi</math>                  ② <math>\boxed{36} \pi</math></p> <p>(2) ① <math>\sqrt{10} \pi</math>                  ② <math>\frac{5}{2} \pi</math></p> <p>(3) ① <math>\pi d [d\pi]</math>                  ② <math>\frac{\pi d^2}{4} \left[ \frac{d^2 \pi}{4} \right]</math></p>	<p>(1) (for reference)</p>  <p>[Sol] <math>h : 10 = 1 : \sqrt{2}</math>  <math>h = 5\sqrt{2}</math></p> <p>The area of the triangle is <math>\frac{1}{2} \times 10 \times 5\sqrt{2} = 25\sqrt{2}</math>.</p> <p>The area of the sector is <math>\frac{45}{360} \cdot \pi \cdot 10^2 = \frac{25}{2} \pi</math>.</p> <p>The area of the shaded segment is <math>\frac{25}{2} \pi - 25\sqrt{2}</math>.</p> <p><u><math>\left( \frac{25}{2} \pi - 25\sqrt{2} \right) \text{cm}^2</math></u></p>
189	190
<p><b>II</b></p> <p>(1) <math>A = \frac{\boxed{45}}{360} \pi \cdot 8^2</math>  <math>= \boxed{8} \pi</math></p> <p>(2) <math>5\pi</math></p> <p>(3) <math>\frac{\pi d^2}{12} \left[ \frac{d^2 \pi}{12} \right]</math></p>	<p>(2) (for reference)</p>  <p><u><math>\left( \frac{25}{3} \pi - 25 \right) \text{cm}^2</math></u></p>

# I 191–192

191	192
<p>(1)</p> <p>[Sol] <math>(AB)^2 = 4^2 + \boxed{2}^2 = \boxed{20}</math></p> <p><math>AB = \boxed{2\sqrt{5}}</math></p> <p><u>2√5</u></p>	<p>(1)</p> <p>[Sol] <math>(AB)^2 = 4^2 + \boxed{3}^2 = \boxed{25}</math></p> <p><math>AB = \boxed{5}</math></p> <p><u>5</u></p> <p>(2) <u>5√2</u></p>
191	192
<p>(2) <u>13</u></p> <p>(3) <u>9√2</u></p> <p>(4) <u>3√10</u></p>	<p>(3) <u>10√2</u></p> <p>(4) <u><math>\frac{3\sqrt{2}}{2}</math></u></p>

193	194
<p>(1)</p> <p>[Sol] <math>(AB)^2 = 6^2 + \boxed{2}^2 = \boxed{40}</math></p> <p><math>AB = 2\sqrt{10}</math></p> <p><math>(BC)^2 = 2^2 + \boxed{4}^2 = \boxed{20}</math></p> <p><math>BC = 2\sqrt{5}</math></p> <p><math>(CA)^2 = 4^2 + \boxed{2}^2 = \boxed{20}</math></p> <p><math>CA = 2\sqrt{5}</math></p> <p><math>AB + BC + CA = 2\sqrt{10} + 4\sqrt{5}</math></p> <p><u><math>2\sqrt{10} + 4\sqrt{5}</math></u></p>	<p>(1)</p> <p>[Sol] <math>(AP)^2 = (AB)^2 + (BP)^2</math></p> <p><math>= \boxed{4}^2 + (x-3)^2</math></p> <p><math>5^2 = \boxed{4}^2 + (x-3)^2</math></p> <p><math>(x-3)^2 = \boxed{9}</math></p> <p><math>x-3 = \pm \boxed{3}</math></p> <p><math>x = \boxed{0}, \boxed{6}</math></p> <p><math>P(\boxed{0}, 0), (\boxed{6}, 0)</math></p>
193	194
<p>(2)</p> <p>[Sol] <math>(AB)^2 = 9^2 + 3^2 = 90</math></p> <p><math>AB = 3\sqrt{10}</math></p> <p><math>BC = 6</math></p> <p><math>(CA)^2 = 9^2 + 3^2 = 90</math></p> <p><math>CA = 3\sqrt{10}</math></p> <p><math>AB + BC + CA = 6\sqrt{10} + 6</math></p> <p><u><math>6\sqrt{10} + 6</math></u></p>	<p>(2)</p> <p>[Sol] <math>(AP)^2 = (AB)^2 + (BP)^2</math></p> <p><math>= \boxed{5}^2 + (y-4)^2</math></p> <p><math>13^2 = 5^2 + (y-4)^2</math></p> <p><math>y = -8, 16</math></p> <p><math>P(0, \boxed{-8}), (0, \boxed{16})</math></p>

# I 195–196

195	196
<p>(1)</p> <p>[Sol] <math>(AB)^2 = 10^2 = 100</math></p> <p><math>(AP)^2 = \boxed{4}^2 + a^2 = \boxed{16} + a^2</math></p> <p><math>(BP)^2 = \boxed{6}^2 + a^2 = \boxed{36} + a^2</math></p> <p><math>100 = (\boxed{16} + a^2) + (\boxed{36} + a^2)</math></p> <p><math>2a^2 = \boxed{48}</math></p> <p><math>a^2 = \boxed{24}</math></p> <p><math>a = \boxed{2\sqrt{6}}</math></p> <p><math>P(0, \boxed{2\sqrt{6}})</math></p>	<p>(1)</p> <p>[Sol] <math>0 + 3y = 12</math></p> <p><math>y = \boxed{4}</math></p> <p>Point A <math>(0, \boxed{4})</math></p> <p><math>2x + 0 = 12</math></p> <p><math>x = \boxed{6}</math></p> <p>Point B <math>(\boxed{6}, 0)</math></p> <p><math>(AB)^2 = \boxed{6}^2 + 4^2 = \boxed{52}</math></p> <p><math>AB = 2\sqrt{13}</math></p> <p><u><math>2\sqrt{13}</math></u></p>
195	196
<p>(2)</p> <p>[Sol] <math>(BP)^2 = (a + 3)^2</math></p> <p><math>(AB)^2 = 3^2 + 4^2 = 25</math></p> <p><math>(AP)^2 = a^2 + 4^2</math></p> <p><math>(a + 3)^2 = 25 + (a^2 + 4^2)</math></p> <p><math>a = \frac{16}{3}</math></p> <p><math>P(\boxed{\frac{16}{3}}, 0)</math></p>	<p>(2)</p> <p>[Sol] <math>0 + 3y = 24</math></p> <p><math>y = 8</math></p> <p>Point A <math>(0, 8)</math></p> <p><math>-8x + 0 = 24</math></p> <p><math>x = -3</math></p> <p>Point B <math>(-3, 0)</math></p> <p><math>(AB)^2 = 8^2 + 3^2 = 73</math></p> <p><math>AB = \sqrt{73}</math></p> <p><u><math>\sqrt{73}</math></u></p>

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<p>(1)</p> <p>[Sol] Substituting <math>y = x + 4</math> into</p> $3x + 2y = 13,$ $3x + \boxed{2}(x + 4) = 13$ $\boxed{5}x = \boxed{5}$ $x = \boxed{1}.$ $y = \boxed{1} + 4 = \boxed{5}$ <p>Point A ( <math>\boxed{1}</math>, <math>\boxed{5}</math> )</p> $(\text{AO})^2 = \boxed{1}^2 + \boxed{5}^2 = \boxed{26}$ $\text{AO} = \sqrt{26}$ $\underline{\quad \sqrt{26} \quad}$	<p>(1)</p> <p>[Sol] <math>\sqrt{3}x = -\sqrt{3}x + 6</math></p> $\boxed{2\sqrt{3}}x = 6$ $x = \sqrt{3}$ $y = 3$ <p>A ( <math>\boxed{\sqrt{3}}</math>, <math>\boxed{3}</math> )</p>
197	198
<p>(2)</p> <p>[Sol] <math>x - 6 = -\frac{1}{2}x</math></p> $x = 4$ $y = 4 - 6 = -2$ <p>Point A ( 4, -2 )</p> $(\text{AO})^2 = 4^2 + 2^2 = 20$ $\text{AO} = 2\sqrt{5}$ $\underline{\quad 2\sqrt{5} \quad}$	<p>(2)</p> <p>[Sol] <math>0 = -\sqrt{3}x + 6</math></p> $x = 2\sqrt{3}$ <p>B ( <math>\boxed{2\sqrt{3}}</math>, <math>\boxed{0}</math> )</p> <p>(3)</p> <p>[Sol] <math>(\text{AB})^2 = (2\sqrt{3} - \sqrt{3})^2 + 3^2 = 12</math></p> $\text{AB} = 2\sqrt{3}$ $\underline{\quad 2\sqrt{3} \quad}$

# I 199–200

199	200
<p>(1)</p> <p>[Sol] <math>\frac{1}{2}x^2 = \boxed{2}</math></p> <p><math>x^2 = \boxed{4}</math></p> <p><math>x = \pm \boxed{2}</math></p> <p><math>A(\boxed{-2}, \boxed{2}), B(\boxed{2}, \boxed{2})</math></p>	<p>(1)</p> <p>[Sol] <math>x^2 = \boxed{-x+2}</math></p> <p><math>x = -2, 1</math></p> <p>When <math>x = -2, y = 4.</math></p> <p>When <math>x = 1, y = 1.</math></p> <p><math>A(\boxed{-2}, \boxed{4}), B(\boxed{1}, \boxed{1})</math></p>
199	200
<p>(2)</p> <p>[Sol] <math>(AO)^2 = 2^2 + 2^2 = 8</math></p> <p><math>AO = 2\sqrt{2}</math></p> <p><math>(BO)^2 = 2^2 + 2^2 = 8</math></p> <p><math>BO = 2\sqrt{2}</math></p> <p><math>\begin{cases} AO = 2\sqrt{2} \\ BO = 2\sqrt{2} \end{cases}</math></p> <p>(3) <math>(AB)^2 = 4^2 = 16</math></p> <p><math>(AO)^2 = 8</math></p> <p><math>(BO)^2 = 8</math></p> <p>Therefore <math>(AB)^2 = (AO)^2 + (BO)^2.</math></p> <p>Thus <math>\triangle AOB</math> is a right-angled triangle.</p>	<p>(2)</p> <p>[Sol] <math>(AO)^2 = 2^2 + 4^2 = 20</math></p> <p><math>(AB)^2 = 3^2 + 3^2 = 18</math></p> <p><math>(BO)^2 = 1^2 + 1^2 = 2</math></p> <p>Therefore <math>(AO)^2 = (AB)^2 + (BO)^2.</math></p> <p>Thus <math>\triangle ABO</math> is a right-angled triangle.</p>