

Core 1 Basics Test: Sample Material

Dauntsey's School

No calculators allowed; please answer on file paper.

1: Work out the following:

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|---------------------------------|--|---------------------------------------|
| a) $(-1) - (-9) \times 4$ | b) $(-8) \times (-7) - (-3) \times (-5)$ | c) $(-1) + (-5) \times (-5) + 4$ |
| d) $(-4) + 6 \times 8$ | e) $(-6) \times 9 + (-4) \times 3$ | f) $8 \times 5 - (-6) \times 1$ |
| g) $10 + 2 \times (-4)$ | h) $(-2) + 7 \times 1 + 2$ | i) $3 \times 7 + 4 \times (-10)$ |
| j) $9 - (-5) \times 8$ | k) $(-5) + 3 \times (-6) + (-3)$ | l) $(-3) \times (-3) - 6 \times (-2)$ |
| m) $5 + (-6) \times (-5)$ | n) $4 \times (-8) + 8 \times 8$ | o) $8 - (-9) \times (-5)$ |
| p) $(-2) \times 6 - 3 \times 2$ | | |

2: Work out the following, showing your method and giving your answer in its simplest form:

- | | | | | | |
|----------------------------------|----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| a) $2\frac{1}{4} - 1\frac{6}{7}$ | b) $3\frac{1}{5} + 4\frac{1}{3}$ | c) $3\frac{2}{7} - 1\frac{2}{5}$ | d) $4\frac{3}{5} + 2\frac{5}{6}$ | e) $3\frac{1}{6} + 2\frac{2}{7}$ | f) $4\frac{1}{2} - 1\frac{6}{7}$ |
| g) $3\frac{1}{8} - 1\frac{3}{5}$ | h) $2\frac{1}{3} + 4\frac{1}{2}$ | i) $2\frac{1}{10} - 1\frac{5}{8}$ | j) $4\frac{1}{4} + 3\frac{5}{6}$ | k) $3\frac{5}{7} - 2\frac{1}{10}$ | l) $4\frac{5}{6} + 1\frac{5}{8}$ |
| m) $2\frac{7}{9} + 3\frac{1}{7}$ | n) $4\frac{1}{3} - 1\frac{1}{4}$ | o) $3\frac{1}{8} - 2\frac{5}{9}$ | p) $1\frac{1}{5} + 4\frac{1}{4}$ | | |

3: Work out the following, showing your method and giving your answer in its simplest form:

- | | | | | | |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|---------------------------------------|
| a) $1\frac{1}{7} \times 1\frac{1}{4}$ | b) $1\frac{1}{6} \div 4\frac{1}{2}$ | c) $2\frac{1}{2} \times 3\frac{1}{2}$ | d) $1\frac{1}{2} \div 2\frac{1}{4}$ | e) $1\frac{2}{7} \div 1\frac{3}{7}$ | f) $1\frac{1}{5} \times 2\frac{2}{3}$ |
| g) $1\frac{3}{4} \times 1\frac{1}{9}$ | h) $1\frac{3}{5} \div 1\frac{1}{3}$ | i) $3\frac{1}{3} \times 1\frac{2}{5}$ | j) $1\frac{2}{3} \div 1\frac{4}{5}$ | k) $1\frac{1}{8} \div 2\frac{1}{3}$ | l) $1\frac{1}{6} \times 2\frac{1}{4}$ |
| m) $1\frac{1}{7} \div 3\frac{1}{2}$ | n) $1\frac{1}{4} \times 1\frac{1}{3}$ | o) $2\frac{1}{2} \div 4\frac{1}{2}$ | p) $1\frac{1}{9} \times 2\frac{2}{3}$ | | |

4: Simplify the following:

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|-----------------------------|-------------------------------------|---------------------------------------|----------------------------------|-------------------------------------|
| a) $2w^4y^2 \times 5w^7y^9$ | b) $(2z^8r^2)^2$ | c) $\frac{6g^{10}s^{10}}{3g^9s^6}$ | d) $3bv \times 4b^8v^6$ | e) $\frac{20k^6n^{18}}{5k^3n^{10}}$ |
| f) $(4u^2e^9)^2$ | g) $(3q^6h^{10})^3$ | h) $5x^2a^{10} \times 6x^7a^5$ | i) $\frac{15t^{4,14}}{5t^{3,4}}$ | j) $\frac{12m^{15}c^5}{4m^8c^3}$ |
| k) $(5d^7p^3)^3$ | l) $4f^{10}p^6 \times 5f^{10}p^3$ | m) $\frac{6r^{17}e^{19}}{3r^7e^{10}}$ | n) $(4q^{10}n)^2$ | o) $2g^4v \times 5g^5v^8$ |
| p) $(2w^6h^7)^3$ | q) $\frac{30t^{16}u^{15}}{6t^7u^8}$ | r) $3k^{5,9} \times 5k^{2,3}$ | s) $\frac{12f^7z^{12}}{4f^2z^2}$ | t) $4p^7a^4 \times 5p^{10}a^8$ |
| u) $(3x^8y)^2$ | v) $\frac{6l^{15}c^8}{3l^6c^4}$ | w) $(5bs^3)^3$ | x) $2m^9d^3 \times 5m^9d^2$ | |

5: Work out the following:

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|-------------|-------------|--------------|-----------|--------------|-------------|
| a) 5^0 | b) 8^{-1} | c) 10^{-1} | d) 10^0 | e) 10^{-2} | f) 1^0 |
| g) 1^{-3} | h) 3^0 | i) 4^{-2} | j) 6^0 | k) 8^0 | l) 5^{-1} |
| m) 2^{-3} | n) 7^0 | o) 2^{-2} | p) 4^0 | | |

6: Work out the following:

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|------------------|------------------|----------------|---------------|-----------------|---------------|
| a) $2500^{-1/2}$ | b) $9^{1/2}$ | c) $27^{-1/3}$ | d) $4^{1/2}$ | e) $8^{-1/3}$ | f) $36^{1/2}$ |
| g) $1^{1/3}$ | h) $1000^{-1/3}$ | i) $25^{-1/2}$ | j) $16^{1/2}$ | k) $125^{-1/3}$ | l) $81^{1/2}$ |
| m) $400^{1/2}$ | n) $64^{-1/2}$ | o) $9^{-1/2}$ | p) $4^{1/2}$ | | |

7: Simplify the following surds:

- | | | | | | |
|-----------------------------|-----------------------------|-----------------------------|----------------------------|----------------------------|---------------------------|
| a) $\sqrt{250} - \sqrt{90}$ | b) $\sqrt{160} + \sqrt{40}$ | c) $\sqrt{90} + \sqrt{250}$ | d) $\sqrt{80} - \sqrt{20}$ | e) $\sqrt{48} + \sqrt{27}$ | f) $\sqrt{27} - \sqrt{3}$ |
|-----------------------------|-----------------------------|-----------------------------|----------------------------|----------------------------|---------------------------|

g) $\sqrt{45} - \sqrt{20}$	h) $\sqrt{12} + \sqrt{3}$	i) $\sqrt{125} + \sqrt{80}$	j) $\sqrt{175} - \sqrt{63}$	k) $\sqrt{40} - \sqrt{10}$	l) $\sqrt{63} + \sqrt{112}$
m) $\sqrt{18} - \sqrt{8}$	n) $\sqrt{96} + \sqrt{6}$	o) $\sqrt{54} - \sqrt{6}$	p) $\sqrt{32} + \sqrt{18}$		

8: Simplify the following surds:

a) $\frac{10}{\sqrt{3}}$	b) $\frac{1}{\sqrt{10}}$	c) $\frac{3}{\sqrt{2}}$	d) $\frac{5}{\sqrt{7}}$
e) $\frac{4}{\sqrt{3}}$	f) $\frac{3}{\sqrt{10}}$	g) $\frac{4}{\sqrt{5}}$	h) $\frac{7}{\sqrt{10}}$

9: Simplify the following surds:

a) $(6 + \sqrt{5})^2$	b) $(1 + \sqrt{3})^2$	c) $(3 - \sqrt{10})^2$	d) $(2 - \sqrt{7})^2$
e) $(4 + \sqrt{6})^2$	f) $(5 - \sqrt{2})^2$	g) $(3 + \sqrt{3})^2$	h) $(6 - \sqrt{7})^2$

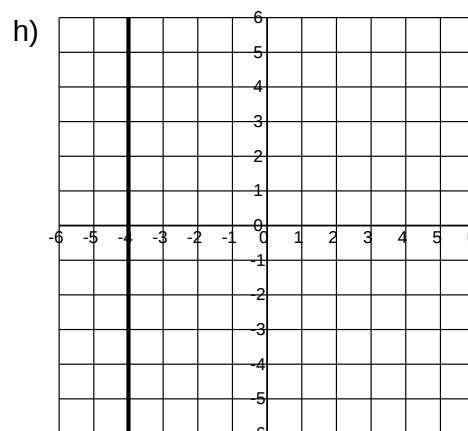
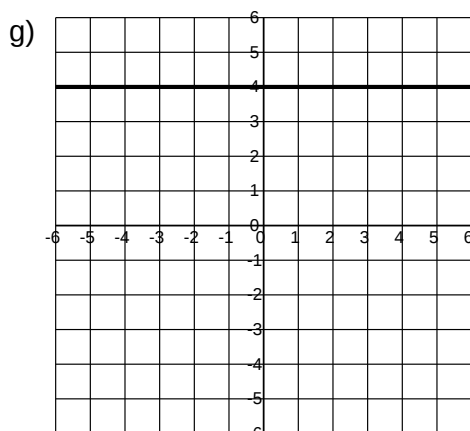
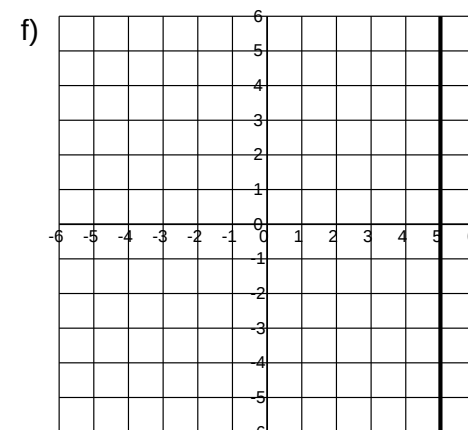
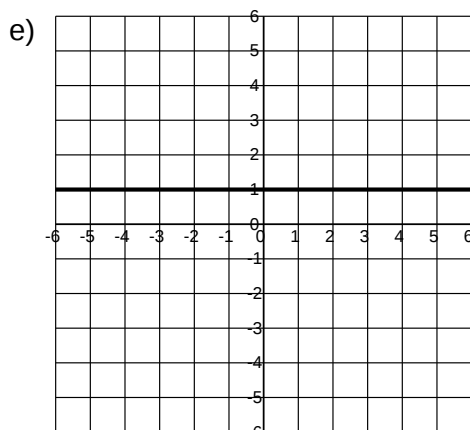
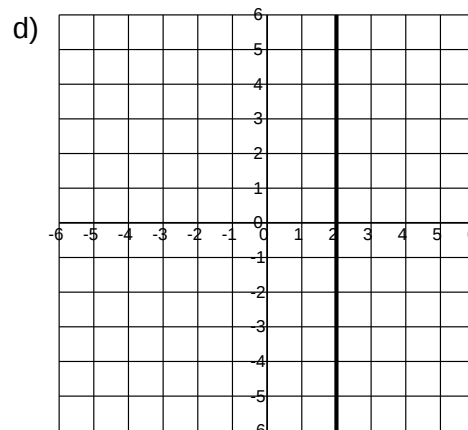
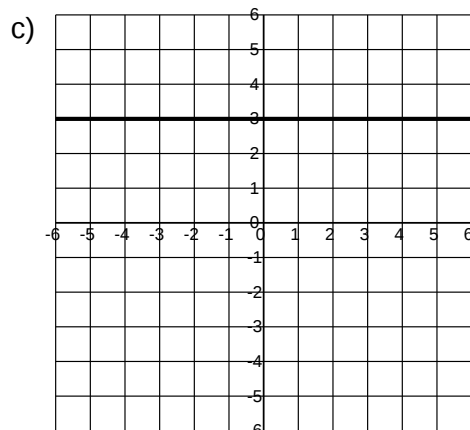
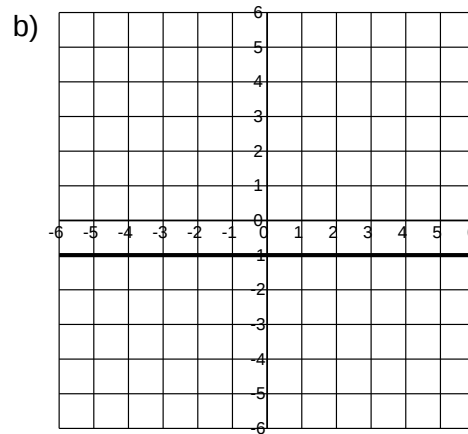
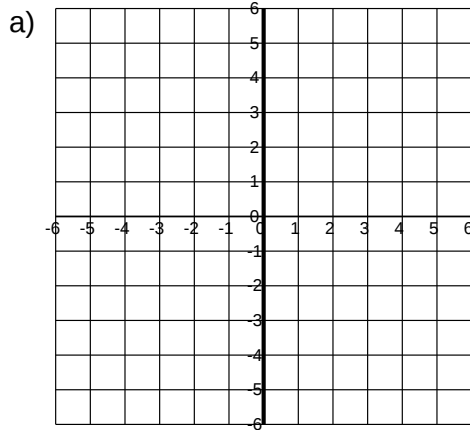
10: Solve the following:

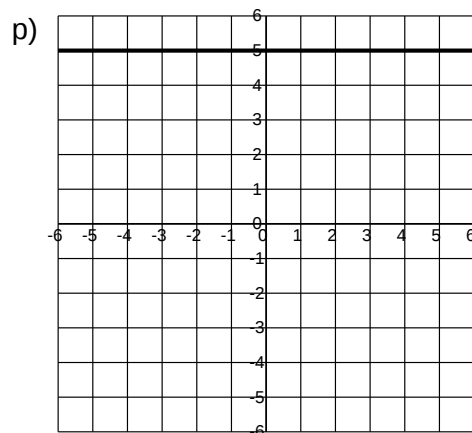
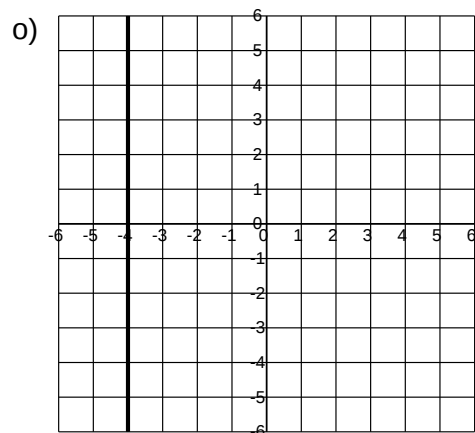
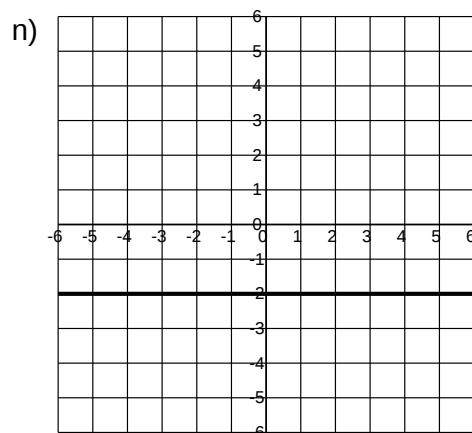
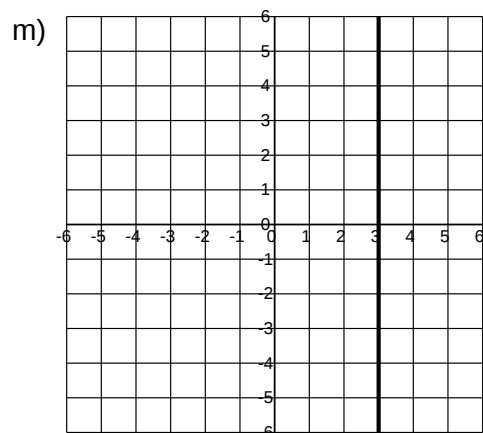
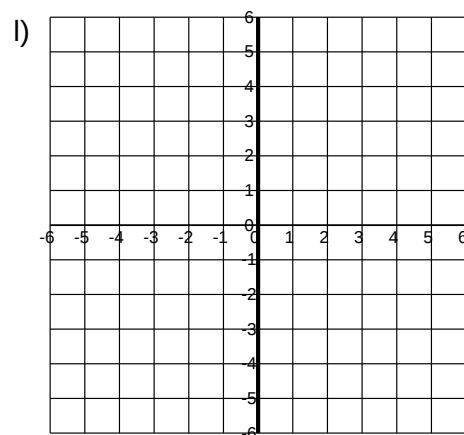
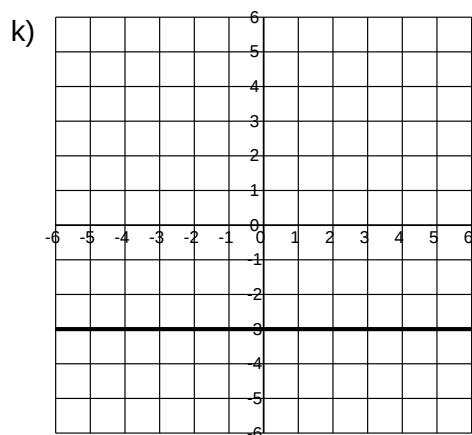
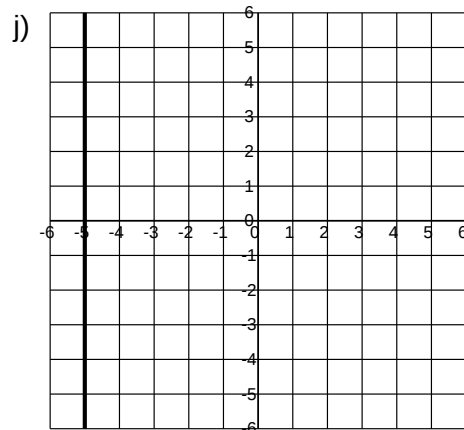
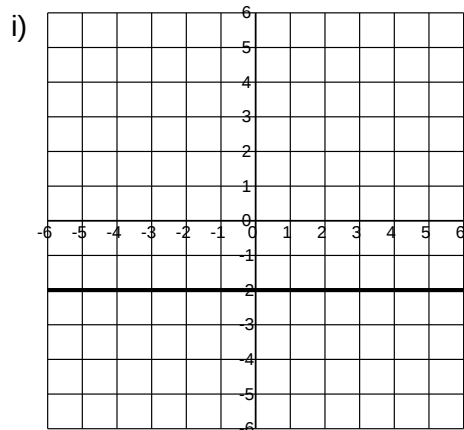
a) $-10(x - 8) > 170$	b) $-x - 10 \geq -19$	c) $-9x + 9 < 9$	d) $-6x \leq -30$
e) $-3x > 18$	f) $-x - 9 \geq -15$	g) $-8x + 10 < -70$	h) $-4(x + 2) \leq 0$
i) $-x - 4 < -1$	j) $-6x \geq 24$	k) $-10x + 5 > -35$	l) $-5(x - 7) \leq 30$
m) $-3(x - 6) < 21$	n) $-8x \geq -56$	o) $-x - 5 > 2$	p) $-2x + 3 \leq 19$

11: Solve the following inequalities:

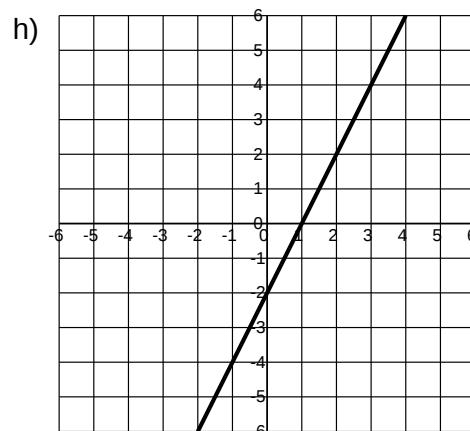
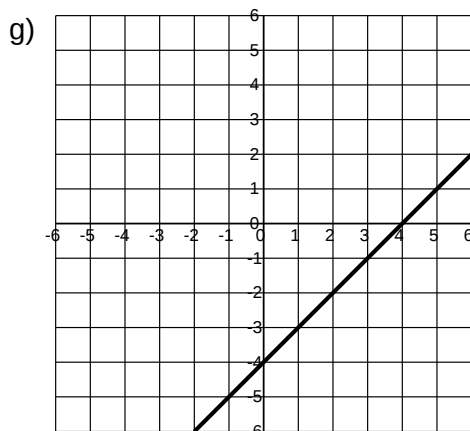
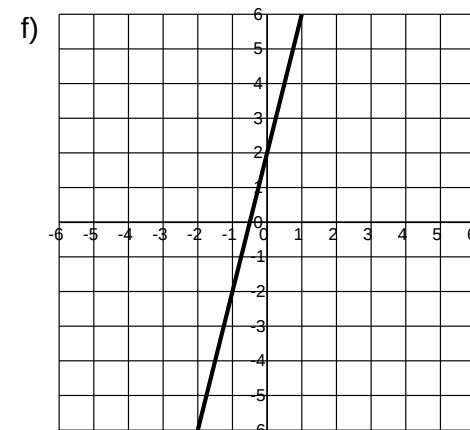
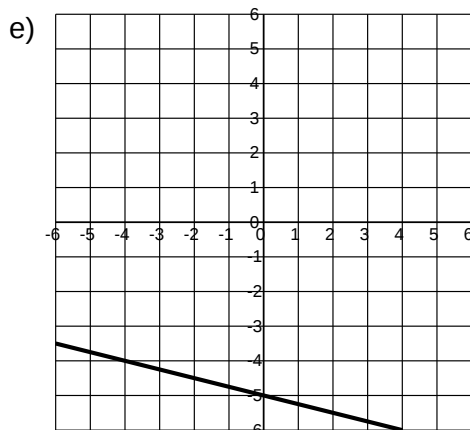
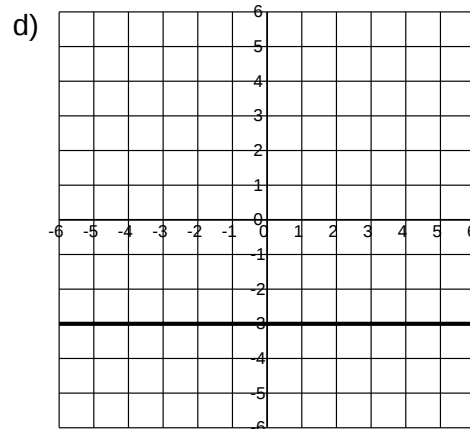
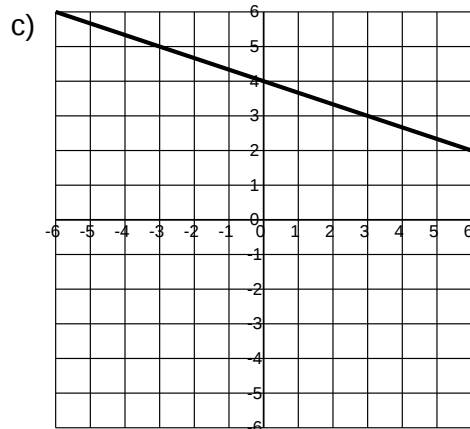
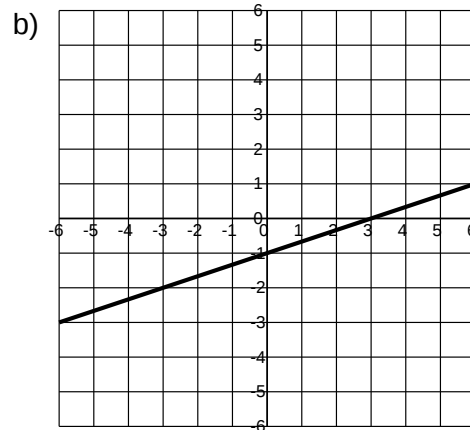
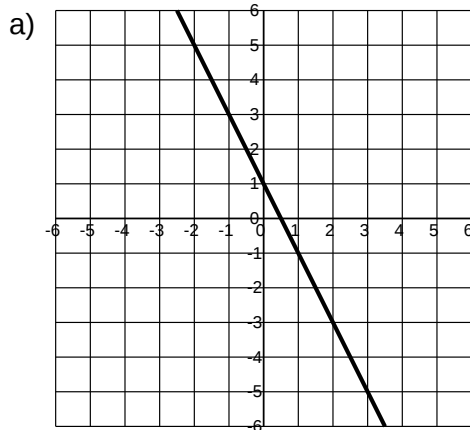
a) $2x^2 + 9 < 17$	b) $4x^2 - 3 > 321$	c) $3x^2 + 14 \leq 41$	d) $4x^2 + 19 \geq 163$	e) $3x^2 + 11 > 158$
f) $2x^2 - 2 < 0$	g) $2x^2 + 14 \leq 214$	h) $4x^2 + 6 \geq 106$	i) $3x^2 - 3 > 45$	j) $2x^2 - 19 < 109$
k) $3x^2 - 19 \leq -7$	l) $4x^2 - 1 \geq 323$	m) $2x^2 + 11 \leq 109$	n) $4x^2 + 8 < 152$	o) $3x^2 + 15 > 63$
p) $4x^2 + 5 \geq 261$				

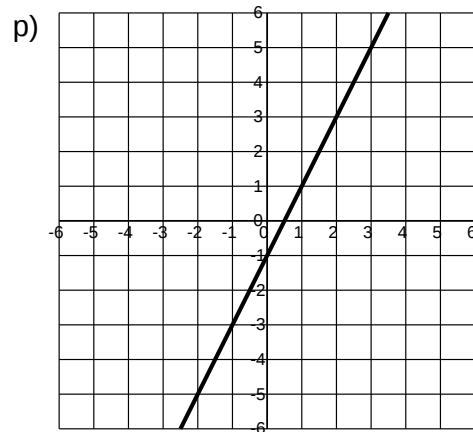
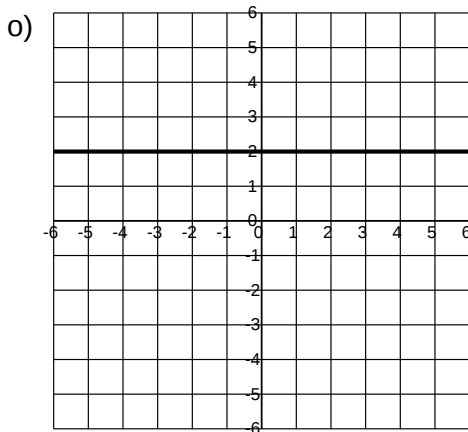
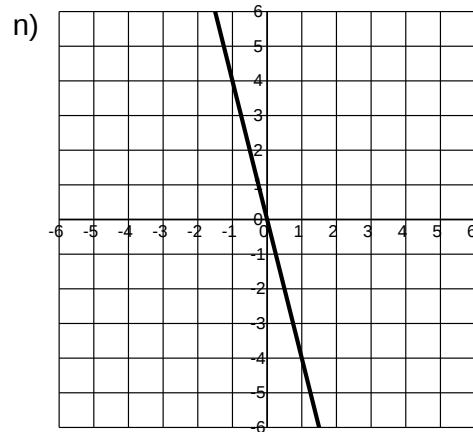
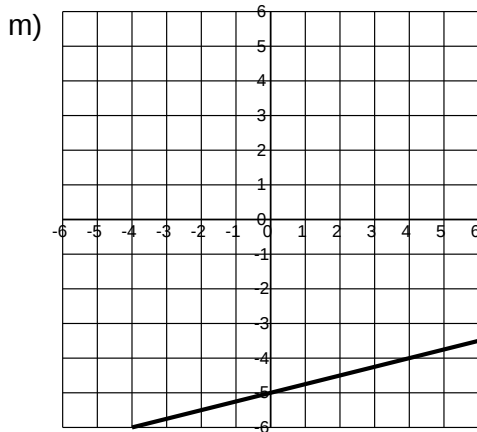
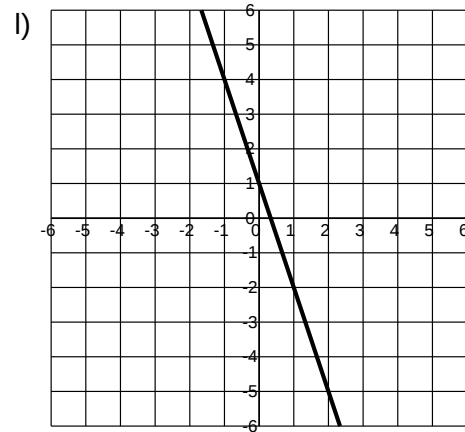
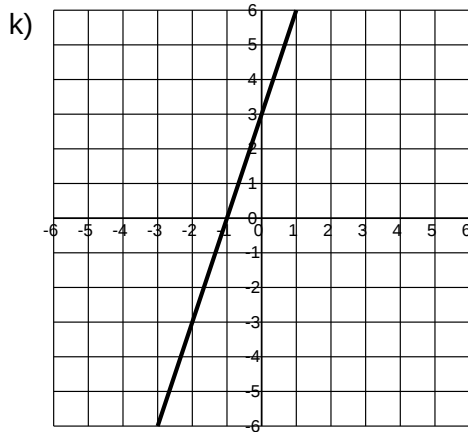
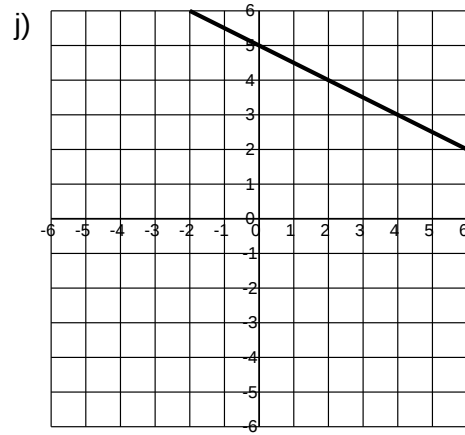
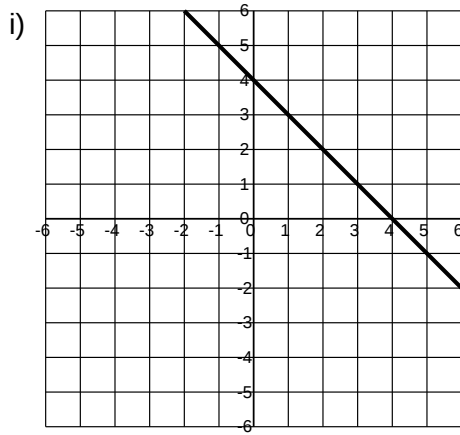
12: Give equations for the following graphs:





13: Give equations for the following graphs:





14: Work out the following:

- A line segment is drawn between (0, 10) and (3, 7). Find its gradient, mid-point and length.
- A line segment is drawn between (3, 1) and (4, 2). Find its gradient, mid-point and length.
- A line segment is drawn between (5, 9) and (7, 7). Find its gradient, mid-point and length.
- A line segment is drawn between (3, 5) and (8, 7). Find its gradient, mid-point and length.
- A line segment is drawn between (4, 6) and (8, 2). Find its gradient, mid-point and length.
- A line segment is drawn between (1, 0) and (4, 5). Find its gradient, mid-point and length.
- A line segment is drawn between (6, 3) and (8, 7). Find its gradient, mid-point and length.
- A line segment is drawn between (8, 5) and (9, 5). Find its gradient, mid-point and length.
- A line segment is drawn between (2, 9) and (7, 8). Find its gradient, mid-point and length.
- A line segment is drawn between (2, 2) and (6, 5). Find its gradient, mid-point and length.
- A line segment is drawn between (1, 10) and (2, 5). Find its gradient, mid-point and length.
- A line segment is drawn between (1, 5) and (4, 2). Find its gradient, mid-point and length.
- A line segment is drawn between (3, 4) and (5, 6). Find its gradient, mid-point and length.
- A line segment is drawn between (3, 4) and (8, 0). Find its gradient, mid-point and length.
- A line segment is drawn between (2, 7) and (3, 6). Find its gradient, mid-point and length.
- A line segment is drawn between (6, 4) and (10, 5). Find its gradient, mid-point and length.

15: Multiply out and simplify the following:

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|------------------------|-------------------------|------------------------|-------------------------|
| a) $(-7n + 9)(5n - 4)$ | b) $(-2f + 7)(7f - 10)$ | c) $(-6g - 8)(2g - 3)$ | d) $(-9u + 1)(-7u - 7)$ |
| e) $(2k - 7)(4k - 6)$ | f) $(2w + 4)(-9w + 4)$ | g) $(6h + 8)(-2h - 8)$ | h) $(-8r + 9)(-6r - 1)$ |

16: Solve by factorising:

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|-------------------------|-----------------------|-------------------------|-------------------------|
| a) $e^2 - 14e + 48 = 0$ | b) $p^2 - 9 = 0$ | c) $m^2 - 4m + 4 = 0$ | d) $c^2 + 10c + 16 = 0$ |
| e) $y^2 + 4y = 0$ | f) $v^2 - 36 = 0$ | g) $z^2 + 3z - 10 = 0$ | h) $l^2 - l = 0$ |
| i) $h^2 - 6h + 9 = 0$ | j) $p^2 - 100 = 0$ | k) $n^2 + 17n + 70 = 0$ | l) $f^2 - 13f + 42 = 0$ |
| m) $b^2 - 18b + 81 = 0$ | n) $g^2 - 7g + 6 = 0$ | o) $x^2 + 5x - 36 = 0$ | p) $a^2 + 6a = 0$ |

17: Factorise the following:

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|----------------------|----------------------|----------------------|----------------------|
| a) $12t^2 - 13t + 3$ | b) $36s^2 + 13s + 1$ | c) $4d^2 + 11d - 3$ | d) $40c^2 - 11c - 2$ |
| e) $24v^2 - 13v - 2$ | f) $50r^2 - 15r + 1$ | g) $5u^2 - 43u - 18$ | h) $12q^2 - 32q + 5$ |

18: Solve using the quadratic formula, giving your answer in simplified surd form:

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|-------------------------|-------------------------|------------------------|-------------------------|
| a) $-2m^2 + 9m + 4 = 0$ | b) $-5b^2 - 7b + 2 = 0$ | c) $3e^2 - 5e - 1 = 0$ | d) $-5n^2 + 5n + 5 = 0$ |
| e) $5t^2 - 10t - 3 = 0$ | f) $-4f^2 + 7f + 4 = 0$ | g) $3w^2 - 6w - 4 = 0$ | h) $3a^2 + 10a + 4 = 0$ |

19: Solve the following simultaneous equations:

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|---|--|--|--|
| a) $v = x^2 - 4x - 17$
$v = -3x - 5$ | b) $k = r^2 - 3r + 8$
$k = 2r + 2$ | c) $c = j^2 + j + 11$
$c = -5j + 3$ | d) $z = q^2 + 9q + 1$
$z = 4q - 5$ |
| e) $h = n^2 + 4n - 4$
$h = 5n - 2$ | f) $b = y^2 - 2y - 10$
$b = -y - 4$ | g) $s = w^2 - 3w + 17$
$s = 4w + 5$ | h) $t = l^2 - 8l - 8$
$t = -5l + 2$ |

20: Simplify the following as far as possible:

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|-------------------------------------|---------------------------------|------------------------------|----------------------------|---------------------------------|--------------------------------------|
| a) $\frac{12f^2 + 12f}{8f^2 + 16f}$ | b) $\frac{2v^2 - 3v}{3v^2 - v}$ | c) $\frac{90a^2 + 30a}{24a}$ | d) $\frac{4d^2 + 16d}{6d}$ | e) $\frac{z^2 + 3z}{2z^2 + 3z}$ | f) $\frac{27p^2 - 18p}{24p^2 + 12p}$ |
|-------------------------------------|---------------------------------|------------------------------|----------------------------|---------------------------------|--------------------------------------|

g) $\frac{8u^2 - 8u}{20u}$	h) $\frac{q^2 - 3q}{2q^2 - q}$	i) $\frac{20m^2 - 40m}{15m^2 - 60m}$	j) $\frac{3c^2 + 2c}{3c^2 - 2c}$	k) $\frac{2k^2 + 4k}{18k^2 + 6k}$	l) $\frac{9x^2 - 3x}{6x}$
m) $\frac{j^2 - j}{j^2 + 3j}$	n) $\frac{30r^2 + 45r}{25r}$	o) $\frac{3e^2 + 3e}{15e^2 - 60e}$	p) $\frac{2g^2 - 3g}{2g^2 + g}$		

21: Simplify the following as far as possible:

a) $\frac{s-3}{2} - \frac{2s-1}{6}$	b) $\frac{3n+2}{3} + \frac{n+4}{2}$	c) $\frac{z-2}{4} + \frac{z-1}{2}$	d) $\frac{7(3y-2)}{8} - \frac{3y-1}{2}$
e) $\frac{2d+3}{5} + \frac{2(3d+1)}{3}$	f) $\frac{7(t+2)}{10} - \frac{t-3}{5}$	g) $\frac{2w-3}{9} + \frac{5(w-2)}{6}$	h) $\frac{2(v+1)}{3} - \frac{2(2v-1)}{9}$
i) $\frac{b-4}{6} + \frac{b+4}{4}$	j) $\frac{3u+2}{8} + \frac{3(u+3)}{4}$	k) $\frac{3(2m+1)}{5} - \frac{m-2}{2}$	l) $\frac{9(c-1)}{10} - \frac{3c-1}{2}$
m) $\frac{r+2}{6} + \frac{2(3r+1)}{3}$	n) $\frac{a+1}{4} - \frac{3a-2}{10}$	o) $\frac{h-4}{4} + \frac{2(2h+1)}{3}$	p) $\frac{2(2k+3)}{3} - \frac{2(k-3)}{9}$

22: Simplify the following as far as possible:

a) $\frac{4}{7f} \times \frac{3}{5f}$	b) $\frac{9g}{4} \div \frac{5}{2g}$	c) $\frac{3q}{2} \div \frac{3q}{4}$	d) $\frac{7}{2j} \times \frac{9j}{2}$	e) $\frac{7l}{6} \div \frac{3l}{10}$	f) $\frac{9p}{10} \times \frac{9}{7p}$
g) $\frac{3}{7e} \times \frac{7}{5e}$	h) $\frac{4}{5x} \div \frac{5x}{9}$	i) $\frac{5}{8n} \div \frac{8}{9n}$	j) $\frac{4s}{7} \times \frac{6}{5s}$	k) $\frac{8d}{3} \div \frac{3d}{5}$	l) $\frac{8}{7u} \times \frac{10u}{7}$
m) $\frac{2}{7b} \times \frac{9}{4b}$	n) $\frac{6v}{7} \div \frac{5v}{2}$	o) $\frac{9w}{10} \div \frac{5}{9w}$	p) $\frac{9}{8m} \times \frac{2m}{3}$		

Answers: Core 1 Basics Test: Sample Material

Dauntsey's School

- 1: a) 35 b) 41 c) 28 d) 44 e) -66 f) 46
 g) 2 h) 7 i) -19 j) 49 k) -26 l) 21
 m) 35 n) 32 o) -37 p) -18

- 2: a) $2\frac{7}{28} - 1\frac{24}{28} = \frac{11}{28}$ b) $3\frac{3}{15} + 4\frac{5}{15} = 7\frac{8}{15}$ c) $3\frac{10}{35} - 1\frac{14}{35} = 1\frac{31}{35}$ d) $4\frac{18}{30} + 2\frac{25}{30} = 7\frac{13}{30}$ e) $3\frac{7}{42} + 2\frac{12}{42} = 5\frac{19}{42}$
 f) $4\frac{7}{14} - 1\frac{12}{14} = 2\frac{9}{14}$ g) $3\frac{5}{40} - 1\frac{24}{40} = 1\frac{21}{40}$ h) $2\frac{2}{6} + 4\frac{3}{6} = 6\frac{5}{6}$ i) $2\frac{4}{40} - 1\frac{25}{40} = \frac{19}{40}$ j) $4\frac{3}{12} + 3\frac{10}{12} = 8\frac{1}{12}$
 k) $3\frac{50}{70} - 2\frac{7}{70} = 1\frac{43}{70}$ l) $4\frac{20}{24} + 1\frac{15}{24} = 6\frac{11}{24}$ m) $2\frac{49}{63} + 3\frac{9}{63} = 5\frac{58}{63}$ n) $4\frac{4}{12} - 1\frac{3}{12} = 3\frac{1}{12}$ o) $3\frac{9}{72} - 2\frac{40}{72} = \frac{41}{72}$
 p) $1\frac{4}{20} + 4\frac{5}{20} = 5\frac{9}{20}$

- 3: a) $\frac{8}{7} \times \frac{5}{4} = \frac{2}{7} \times \frac{5}{1} = \frac{10}{7} = 1\frac{3}{7}$ b) $\frac{7}{6} \div \frac{9}{2} = \frac{7}{6} \times \frac{2}{9} = \frac{7}{3} \times \frac{1}{9} = \frac{7}{27}$ c) $\frac{5}{2} \times \frac{7}{2} = \frac{35}{4} = 8\frac{3}{4}$
 d) $\frac{3}{2} \div \frac{9}{4} = \frac{3}{2} \times \frac{4}{9} = \frac{1}{1} \times \frac{2}{3} = \frac{2}{3}$ e) $\frac{9}{7} \div \frac{10}{7} = \frac{9}{7} \times \frac{7}{10} = \frac{9}{1} \times \frac{1}{10} = \frac{9}{10}$ f) $\frac{6}{5} \times \frac{8}{3} = \frac{2}{5} \times \frac{8}{1} = \frac{16}{5} = 3\frac{1}{5}$
 g) $\frac{7}{4} \times \frac{10}{9} = \frac{7}{2} \times \frac{5}{9} = \frac{35}{18} = 1\frac{17}{18}$ h) $\frac{8}{5} \div \frac{4}{3} = \frac{8}{5} \times \frac{3}{4} = \frac{2}{5} \times \frac{3}{1} = \frac{6}{5} = 1\frac{1}{5}$ i) $\frac{10}{3} \times \frac{7}{5} = \frac{2}{3} \times \frac{7}{1} = \frac{14}{3} = 4\frac{2}{3}$
 j) $\frac{5}{3} \div \frac{9}{5} = \frac{5}{3} \times \frac{5}{9} = \frac{25}{27}$ k) $\frac{9}{8} \div \frac{7}{3} = \frac{9}{8} \times \frac{3}{7} = \frac{27}{56}$ l) $\frac{7}{6} \times \frac{9}{4} = \frac{7}{2} \times \frac{3}{4} = \frac{21}{8} = 2\frac{5}{8}$
 m) $\frac{8}{7} \div \frac{7}{2} = \frac{8}{7} \times \frac{2}{7} = \frac{16}{49}$ n) $\frac{5}{4} \times \frac{4}{3} = \frac{5}{1} \times \frac{1}{3} = \frac{5}{3} = 1\frac{2}{3}$ o) $\frac{5}{2} \div \frac{9}{2} = \frac{5}{2} \times \frac{2}{9} = \frac{5}{1} \times \frac{1}{9} = \frac{5}{9}$
 p) $\frac{10}{9} \times \frac{8}{3} = \frac{80}{27} = 2\frac{26}{27}$

- 4: a) $10w^{11}y^{11}$ b) $4z^{16}r^4$ c) $2gs^4$ d) $12b^9v^7$ e) $4k^3n^8$ f) $16u^4e^{18}$
 g) $27q^{18}h^{30}$ h) $30x^9a^{15}$ i) $3tj^{10}$ j) $3m^7c^2$ k) $125d^{21}p^9$ l) $20f^{20}p^9$
 m) $2r^{10}e^9$ n) $16q^{20}n^2$ o) $10g^9v^9$ p) $8w^{18}h^{21}$ q) $5t^9u^7$ r) $15k^7j^{12}$
 s) $3f^5z^{10}$ t) $20p^{17}a^{12}$ u) $9x^{16}y^2$ v) $2f^9c^4$ w) $125b^3s^9$ x) $10m^{18}d^5$

- 5: a) 1 b) $\frac{1}{8}$ c) $\frac{1}{10}$ d) 1 e) $\frac{1}{100}$ f) 1
 g) 1 h) 1 i) $\frac{1}{16}$ j) 1 k) 1 l) $\frac{1}{5}$
 m) $\frac{1}{8}$ n) 1 o) $\frac{1}{4}$ p) 1

- 6: a) $\frac{1}{50}$ b) 3 c) $\frac{1}{3}$ d) 2 e) $\frac{1}{2}$ f) 6
 g) 1 h) $\frac{1}{10}$ i) $\frac{1}{5}$ j) 4 k) $\frac{1}{5}$ l) 9
 m) 20 n) $\frac{1}{8}$ o) $\frac{1}{3}$ p) 2

- 7: a) $2\sqrt{10}$ b) $6\sqrt{10}$ c) $8\sqrt{10}$ d) $2\sqrt{5}$ e) $7\sqrt{3}$ f) $2\sqrt{3}$
 g) $\sqrt{5}$ h) $3\sqrt{3}$ i) $9\sqrt{5}$ j) $2\sqrt{7}$ k) $\sqrt{10}$ l) $7\sqrt{7}$
 m) $\sqrt{2}$ n) $5\sqrt{6}$ o) $2\sqrt{6}$ p) $7\sqrt{2}$

- 8: a) $\frac{10\sqrt{3}}{3}$ b) $\frac{\sqrt{10}}{10}$ c) $\frac{3\sqrt{2}}{2}$ d) $\frac{5\sqrt{7}}{7}$
 e) $\frac{4\sqrt{3}}{3}$ f) $\frac{3\sqrt{10}}{10}$ g) $\frac{4\sqrt{5}}{5}$ h) $\frac{7\sqrt{10}}{10}$

- 9: a) $41 + 12\sqrt{5}$ b) $4 + 2\sqrt{3}$ c) $19 - 6\sqrt{10}$ d) $11 - 4\sqrt{7}$
 e) $22 + 8\sqrt{6}$ f) $27 - 10\sqrt{2}$ g) $12 + 6\sqrt{3}$ h) $43 - 12\sqrt{7}$

- 10: a) $x < -9$ b) $x \leq 9$ c) $x > 0$ d) $x \geq 5$ e) $x < -6$ f) $x \leq 6$
 g) $x > 10$ h) $x \geq -2$ i) $x > -3$ j) $x \leq -4$ k) $x < 4$ l) $x \geq 1$
 m) $x > -1$ n) $x \leq 7$ o) $x < -7$ p) $x \geq -8$

11:	a) $-2 < x < 2$ e) $x < -7$ or $x > 7$ i) $x < -4$ or $x > 4$ m) $-7 \leq x \leq 7$	b) $x < -9$ or $x > 9$ f) $-1 < x < 1$ j) $-8 < x < 8$ n) $-6 < x < 6$	c) $-3 \leq x \leq 3$ g) $-10 \leq x \leq 10$ k) $-2 \leq x \leq 2$ o) $x < -4$ or $x > 4$	d) $x \leq -6$ or $x \geq 6$ h) $x \leq -5$ or $x \geq 5$ l) $x \leq -9$ or $x \geq 9$ p) $x \leq -8$ or $x \geq 8$		
12:	a) $x = 0$ g) $y = 4$ m) $x = 3$	b) $y = -1$ h) $x = -4$ n) $y = -2$	c) $y = 3$ i) $y = -2$ o) $x = -4$	d) $x = 2$ j) $x = -5$ p) $y = 5$	e) $y = 1$ k) $y = -3$	f) $x = 5$ l) $x = 0$
13:	a) $y = -2x + 1$ g) $y = x - 4$ m) $y = \frac{1}{4}x - 5$	b) $y = \frac{1}{3}x - 1$ h) $y = 2x - 2$ n) $y = -4x$	c) $y = -\frac{1}{3}x + 4$ i) $y = -x + 4$ o) $y = 2$	d) $y = -3$ j) $y = -\frac{1}{2}x + 5$ p) $y = 2x - 1$	e) $y = -\frac{1}{4}x - 5$ k) $y = 3x + 3$	f) $y = 4x + 2$ l) $y = -3x + 1$
14:	a) Gradient = -1 Mid-point = $(1.5, 8.5)$ Length = $\sqrt{18}$ e) Gradient = -1 Mid-point = $(6, 4)$ Length = $\sqrt{32}$ i) Gradient = $-\frac{1}{5}$ Mid-point = $(4.5, 8.5)$ Length = $\sqrt{26}$ m) Gradient = 1 Mid-point = $(4, 5)$ Length = $\sqrt{8}$	b) Gradient = 1 Mid-point = $(3.5, 1.5)$ Length = $\sqrt{2}$ f) Gradient = $\frac{5}{3}$ Mid-point = $(2.5, 2.5)$ Length = $\sqrt{34}$ j) Gradient = $\frac{3}{4}$ Mid-point = $(4, 3.5)$ Length = $\sqrt{25} = 5$ n) Gradient = $-\frac{4}{5}$ Mid-point = $(5.5, 2)$ Length = $\sqrt{41}$	c) Gradient = -1 Mid-point = $(6, 8)$ Length = $\sqrt{8}$ g) Gradient = 2 Mid-point = $(7, 5)$ Length = $\sqrt{20}$ k) Gradient = -5 Mid-point = $(1.5, 7.5)$ Length = $\sqrt{26}$ o) Gradient = -1 Mid-point = $(2.5, 6.5)$ Length = $\sqrt{2}$	d) Gradient = $\frac{2}{5}$ Mid-point = $(5.5, 6)$ Length = $\sqrt{29}$ h) Gradient = 0 Mid-point = $(8.5, 5)$ Length = $\sqrt{1} = 1$ l) Gradient = -1 Mid-point = $(2.5, 3.5)$ Length = $\sqrt{18}$ p) Gradient = $\frac{1}{4}$ Mid-point = $(8, 4.5)$ Length = $\sqrt{17}$		
15:	a) $-35n^2 + 73n - 36$ e) $8k^2 - 40k + 42$	b) $-14f^2 + 69f - 70$ f) $-18w^2 - 28w + 16$	c) $-12g^2 + 2g + 24$ g) $-12h^2 - 64h - 64$	d) $63u^2 + 56u - 7$ h) $48r^2 - 46r - 9$		
16:	a) $e = 6, e = 8$ f) $v = 6, v = -6$ k) $n = -10, n = -7$ p) $a = 0, a = -6$	b) $p = -3, p = 3$ g) $z = 2, z = -5$ l) $f = 7, f = 6$	c) $m = 2$ h) $l = 0, l = 1$ m) $b = 9$	d) $c = -2, c = -8$ i) $h = 3$ n) $g = 1, g = 6$	e) $y = 0, y = -4$ j) $p = -10, p = 10$ o) $x = 4, x = -9$	
17:	a) $(4t - 3)(3t - 1)$ e) $(8v + 1)(3v - 2)$	b) $(4s + 1)(9s + 1)$ f) $(5r - 1)(10r - 1)$	c) $(d + 3)(4d - 1)$ g) $(u - 9)(5u + 2)$	d) $(5c - 2)(8c + 1)$ h) $(6q - 1)(2q - 5)$		
18:	a) $m = 2\frac{1}{4} \pm \frac{1}{4}\sqrt{113}$ e) $t = 1 \pm \frac{2}{5}\sqrt{10}$	b) $b = -\frac{7}{10} \pm \frac{1}{10}\sqrt{89}$ f) $f = \frac{7}{8} \pm \frac{1}{8}\sqrt{113}$	c) $e = \frac{5}{6} \pm \frac{1}{6}\sqrt{37}$ g) $w = 1 \pm \frac{1}{3}\sqrt{21}$	d) $n = \frac{1}{2} \pm \frac{1}{2}\sqrt{5}$ h) $a = -1\frac{2}{3} \pm \frac{1}{3}\sqrt{13}$		
19:	a) $x = -3$ and $v = 4$ $x = 4$ and $v = -17$ e) $n = -1$ and $h = -7$ $n = 2$ and $h = 8$	b) $r = 2$ and $k = 6$ $r = 3$ and $k = 8$ f) $y = -2$ and $b = -2$ $y = 3$ and $b = -7$	c) $j = -4$ and $c = 23$ $j = -2$ and $c = 13$ g) $w = 3$ and $s = 17$ $w = 4$ and $s = 21$	d) $q = -3$ and $z = -17$ $q = -2$ and $z = -13$ h) $l = -2$ and $t = 12$ $l = 5$ and $t = -23$		
20:	a) $\frac{3(f + 1)}{2(f + 2)}$ g) $\frac{2(u - 1)}{5}$	b) $\frac{2v - 3}{3v - 1}$ h) $\frac{q - 3}{2q - 1}$	c) $\frac{5(3a + 1)}{4}$ i) $\frac{4(m - 2)}{3(m - 4)}$	d) $\frac{2(d + 4)}{3}$ j) $\frac{3c + 2}{3c - 2}$	e) $\frac{z + 3}{2z + 3}$ k) $\frac{k + 2}{3(3k + 1)}$	f) $\frac{3(3p - 2)}{4(2p + 1)}$ l) $\frac{3x - 1}{2}$

m) $\frac{j-1}{j+3}$

n) $\frac{3(2r+3)}{5}$

o) $\frac{e+1}{5(e-4)}$

p) $\frac{2g-3}{2g+1}$

21: a) $\frac{3s-9}{6} - \frac{2s-1}{6} = \frac{s-8}{6}$

b) $\frac{6n+4}{6} + \frac{3n+12}{6} = \frac{9n+16}{6}$

c) $\frac{z-2}{4} + \frac{2z-2}{4} = \frac{3z-4}{4}$

d) $\frac{21y-14}{8} - \frac{12y-4}{8} = \frac{9y-10}{8}$

e) $\frac{6d+9}{15} + \frac{30d+10}{15} = \frac{36d+19}{15}$

f) $\frac{7t+14}{10} - \frac{2t-6}{10} = \frac{5t+20}{10} = \frac{5(t+4)}{10} = \frac{t+4}{2}$

g) $\frac{4w-6}{18} + \frac{15w-30}{18} = \frac{19w-36}{18}$

h) $\frac{6v+6}{9} - \frac{4v-2}{9} = \frac{2v+8}{9} = \frac{2(v+4)}{9}$

i) $\frac{2b-8}{12} + \frac{3b+12}{12} = \frac{5b+4}{12}$

j) $\frac{3u+2}{8} + \frac{6u+18}{8} = \frac{9u+20}{8}$

k) $\frac{12m+6}{10} - \frac{5m-10}{10} = \frac{7m+16}{10}$

l) $\frac{9c-9}{10} - \frac{15c-5}{10} = \frac{-6c-4}{10} = \frac{-2(3c+2)}{10} = \frac{-(3c+2)}{5}$

m) $\frac{r+2}{6} + \frac{12r+4}{6} = \frac{13r+6}{6}$

n) $\frac{5a+5}{20} - \frac{6a-4}{20} = \frac{-a+9}{20} = \frac{-(a-9)}{20}$

o) $\frac{3h-12}{12} + \frac{16h+8}{12} = \frac{19h-4}{12}$

p) $\frac{12k+18}{9} - \frac{2k-6}{9} = \frac{10k+24}{9} = \frac{2(5k+12)}{9}$

22: a) $\frac{12}{35f^2}$

b) $\frac{9g}{4} \times \frac{2g}{5} = \frac{18g^2}{20} = \frac{9g^2}{10}$

c) $\frac{3q}{2} \times \frac{4}{3q} = \frac{12q}{6q} = 2$

d) $\frac{63j}{4j} = \frac{63}{4}$

e) $\frac{7l}{6} \times \frac{10}{3l} = \frac{70l}{18l} = \frac{35}{9}$

f) $\frac{81p}{70p} = \frac{81}{70}$

g) $\frac{21}{35e^2} = \frac{3}{5e^2}$

h) $\frac{4}{5x} \times \frac{9}{5x} = \frac{36}{25x^2}$

i) $\frac{5}{8n} \times \frac{9n}{8} = \frac{45n}{64n} = \frac{45}{64}$

j) $\frac{24s}{35s} = \frac{24}{35}$

k) $\frac{8d}{3} \times \frac{5}{3d} = \frac{40d}{9d} = \frac{40}{9}$

l) $\frac{80u}{49u} = \frac{80}{49}$

m) $\frac{18}{28b^2} = \frac{9}{14b^2}$

n) $\frac{6v}{7} \times \frac{2}{5v} = \frac{12v}{35v} = \frac{12}{35}$

o) $\frac{9w}{10} \times \frac{9w}{5} = \frac{81w^2}{50}$

p) $\frac{18m}{24m} = \frac{3}{4}$