Year 8
2025   Mathematics   2026
Unit 8 Tasks – Part 1

DO NOT WRITE INSIDE

Year 8

2025   **Mathematics**   **2026**

Unit 8 Tasks – Part 2

DO NOT WRITE INSIDE

Contents

Intelligent Practice

Term	Product of Factors
$2p$	
$4p$	
$6p$	
$9p$	
$12p$	
$12pr$	
$12p^2$	
$12p^2r$	
$20p^2r$	
$20p^2r^2$	
$20p^3r^2$	
$20p^2r^3$	
$30p^4r^7$	

Prime Factorisation… with Algebra!

Complete each **Prime Factorisation Tree**, then write the expression as a product of prime factors.

1) $4x$

$4x = 2 \times 2 \times x$

2) $6y$

$6y =$ _____

3) $20a$

$20a =$ _____

4) $3b^2$

$3b^2 =$ _____

5) $3xy^2$

$3xy^2 =$ _____

6) $14d^3$

$14d^3 =$ _____

7) $33ef^2$

$33ef^2 =$ _____

8) $26g^2h^2$

$26g^2h^2 =$ _____

9) $49i^2 =$

10) $34j^4 =$

11) $121kl^2m =$

12) $550n^3p^2 =$

Intelligent Practice

Term	Term	Highest Common Factor
$2p$	$3p$	
$2p$	$5p$	
$2p$	$6p$	
$3p$	$9p$	
$3p$	$12p$	
$3pr$	$12pr$	
$6pr$	$12pr$	
$9pr$	$12pr$	
$12pr$	$20pr$	
$12r$	$20pr$	
$12p^2r$	$20pr$	
$12p^2r^2$	$20pr$	
$12p^2r^2$	$20p^3r^2$	

Fluency Practice

Question 1: Factorise the following expressions

(a) $4x + 6$ (b) $15x + 20$ (c) $9y - 12$ (d) $5x + 15$

(e) $6x - 3$ (f) $4x + 8$ (g) $5y - 25$ (h) $8w + 24$

(i) $10y + 15$ (j) $14w + 21$ (k) $20y - 30$ (l) $27x + 18$

(m) $6 - 4x$ (n) $9 + 12y$ (o) $45 + 60x$ (p) $16y - 32$

(q) $22a + 55$ (r) $100 - 40y$ (s) $6x + 9y$ (t) $4w - 2a$

(u) $25y - 35z$ (v) $8x^2 + 20$ (w) $30y^3 - 15$ (x) $42y + 28x - 56c$

Question 2: Factorise the following expressions

(a) $x^2 + 7x$ (b) $x^2 - 3x$ (c) $y^2 + y$ (d) $w^2 + 9w$

(e) $x^2 - 7x$ (f) $4w^2 + 10w$ (g) $6x^2 - 8x$ (h) $9y^2 - 6y$

(i) $10c + c^2$ (j) $5g - g^2$ (k) $14x^2 + 35x$ (l) $40x^2 - 50x$

(m) $12x^2 + 18x$ (n) $24x^2 - 18x$ (o) $45y^2 + 60y$ (p) $7w^2 + 2w$

Question 3: Factorise the following expressions

(a) $x^2 + xy$ (b) $a^2 - ab$ (c) $xy + xz$ (d) $ab + ac - ad$

(e) $6c^2 - 4cd$ (f) $10x^2 + 15xy$ (g) $12ab + 18bc$ (h) $8xy + 4y^2$

(i) $8cdf + 10cde$ (j) $7w^2 + 6w + wy$ (k) $8ab^2 - 10ab$ (l) $4xy^2 + 6xy + 2x^2y$

(m) $6mn - 7m^2n$ (n) $11g^2h + 22h^2$

Question 4: Factorise the following expressions

(a) $x^3 + 2x^2$ (b) $5x^3 - x^2$ (c) $8c^3 + 12c$ (d) $10w^2 - 15w^3$

(e) $32y^3 + 24y^2$ (f) $12x^4 + 15x$ (g) $4a^5 - 12a^2$ (h) $8w^9 + w^7$

Question 1:   Explain why 8x + 3y cannot be factorised.

Question 2:   James has factorised an expression correctly.
His answer is 2(7y – 3).
What was the expression that he factorised?

Question 3:   Alexandra is trying to factorise fully 15y + 30.
Rebecca says the answer is 3(5y + 10)
Victoria says the answer is 5(3y + 6)
Alexandra says both Rebecca and Victoria are incorrect, why?

Question 4: Can you spot any mistakes?

Factorise

$$w^2 - 5w$$

$$w(w + 5)$$

....
(1)

Question 5: Can you spot any mistakes?

Factorise completely

$$24x^2 + 20x$$

$$4(6x^2 + 5x)$$

....
(2)

Question 6: Can you spot any mistakes?

Factorise completely

$$20a^2c + 30ac$$

$$5ac(4a^2 + 6)$$

....
(2)

Fluency Practice

Factorising by Taking Out a Common Factor

(a) Factorise $2x + 10$

(b) Factorise $5x - 15$

(c) Factorise $3x + 18$

(d) Factorise $21 - 7x$

(e) Factorise $11x + 44$

(f) Factorise $3x + 3$

(g) Factorise $6x - 3$

(h) Factorise $9x - 12$

(i) Factorise $25 + 30x$

(j) Factorise $28 - 21x$

(k) Factorise $4x - 12$

(l) Factorise $30x + 50$

(m) Factorise $8 - 12x$

(n) Factorise $6x - 24$

(o) Factorise $35x + 21$

(p) Factorise $5x + 15y$

(q) Factorise $16y - 12x$

(r) Factorise $12x + 20y$

(s) Factorise $60x^2 - 24$

(t) Factorise $36 + 144y$

(u) Factorise $-3x - 9$

(v) Factorise $-7 - 7x$

(w) Factorise $5x + 10y + 25$

(x) Factorise $-80x - 40y$

(y) Factorise $12x^2 - 18x + 9$

Fluency Practice

More Factorising by Taking Out a Common Factor

(a) Factorise $ab + ac$	**(b)** Factorise $xy + 2x$	**(c)** Factorise $4x - xy$	**(d)** Factorise $3b + ab$	**(e)** Factorise $2xy + 3x$
(f) Factorise $x^2 + 3x$	**(g)** Factorise $x^2 - 2x$	**(h)** Factorise $x^2 + xy$	**(i)** Factorise $6a - a^2$	**(j)** Factorise $a^2 - ab$
(k) Factorise $2x^2 + 5x$	**(l)** Factorise $3x^2 - x$	**(m)** Factorise $7a + 2a^2$	**(n)** Factorise $5b^2 - bc$	**(o)** Factorise $x + 8x^2$
(p) Factorise $2x^2 + 4x$	**(q)** Factorise $5xy + 20x$	**(r)** Factorise $10ab - 2ac$	**(s)** Factorise $6x^2 + 9xy$	**(t)** Factorise $24x - 18x^2$
(u) Factorise $10a^2b + 15ab$	**(v)** Factorise $35y^2 - 21y^3$	**(w)** Factorise $10xy + 25x^2y - 5xy^2$	**(x)** Factorise $36abc - 24bcd$	**(y)** Factorise $16x^2y + 8x^3 - 12x^4$

Intelligent Practice

Factorising Expressions

A

1) $6x + 20$

2) $20 + 6x$

3) $6x - 20$

4) $12x - 30$

5) $12x - 60$

6) $6x - 30$

7) $30x - 6$

8) $30x - 9$

9) $30x - 9x$

10) $30x^2 - 9x$

B

1) $30x^2 - 9xy$

2) $30x^2y - 9xy$

3) $30x^2y^2 - 9xy$

4) $50 - 45g$

5) $30x^2y^2 - 9x^2y$

6) $30x^4y^2 - 9x^2y$

7) $30x^4y^2 + 9x^2y$

8) $x^4y^2 + x^2y$

9) $x^4y^2 - x^2y$

10) $21v - 35$

C

1) $3x + 3y + 3z$

2) $3x + 6y + 3z$

3) $3x + 6y + 15z$

4) $21x^2y^2 - 35xy^3$

5) $3x + 6xy + 15z$

6) $3x + 6xy + 15xz$

7) $3x^2 + 6xy + 15xz$

8) $x^2 + xy + xz$

9) $45f + 81$

10) $7w + 9xy + 15xz$

Purposeful Practice

- $2(x + 5) = \bullet x + \bullet$
- $\bullet(x + 6) = 3x + \bullet$
- $\bullet(x - 5) = \bullet x - 25$
- $4(\bullet x + \bullet) = 28x + 12$
- $x(x + \bullet) = \bullet^2 + 4x$
- $\bullet(\bullet x - 5) = 6x^2 - 10x$
- $\bullet(\bullet - \bullet) = 6x - 21$
- $\bullet(\bullet + \bullet) = 20x^2 + 24x$

Intelligent Practice

Where possible, finish factorising:

1) $2(3x + 9)$

2) $2(6x + 9)$

3) $2(6x + 10)$

4) $2(6x + 11)$

5) $2(6x + 12)$

6) $2(6x - 12)$

7) $4(12 - 6x)$

8) $4(12 - 6x + 2y)$

9) $4(12 - 6x + 3y)$

10) $4(12 - 6x + 4y)$

11) $4(12 - 6x + 4y)$

12) $4(12 - 6x + 5y)$

13) $4(12x - 6x^2 + 5xy)$

14) $4(12x - 6x^2 + 4xy)$

15) $4(12x^2 - 6x^2 + 4x^2y)$

Fluency Practice

Factorise

(a) $7x + 21$ (b) $3x - 12$

(c) $5y - 25$ (d) $27x + 18$

(e) $8y + 24$ (f) $12 - 9x$

(g) $6y - 5$ (h) $6 + 4x$

(i) $8y - 12$ (j) $6x + 3y$

Factorise

(a) $x^2 + 5x$ (b) $x^2 - 12x$

(c) $6x + x^2$ (d) $2y + 5y^2$

(e) $4x^2 + 7x$ (f) $4x^2 + 8x$

(g) $12y + 4y^2$ (h) $6x^2 - 9x$

(i) $40x^2 + 50x$ (j) $22y^2 - 4y$

Factorise

(a) $x^2 + xy$ (b) $x^2 - 2xy$

(c) $xy + x^2y$ (d) $2xy + 5y$

(e) $4x^2y - xy$ (f) $3xy + 12y$

(g) $45xy - 60y$ (h) $4x^2 - 6y$

(i) $2x^2 - 10y^2$ (j) $24x^2 - 18x$

Factorise

(a) $4ab + 6abc + 8ac$

(b) $9x^2y + 6xy - 15xy^2$

(c) $10ab^2 - 8ab + 2a^2b$

(d) $6xy - 7x^2y + 3xy^2$

Factorise

(a) $20x^2 - 30x^3$

(b) $4x^5 + 6x^2$

(c) $10y^2 - 15y + 25y^3$

(d) $12x^4 + 15x^2 - 9x^3$

Fluency Practice

Factorise fully:

(a) $4x^2y + 10xy^2$

(b) $6ab - 3a^2b^2$

(c) $2x^2y + 5xy$

(d) $abc^2 - a^2c$

Factorise fully:

(a) $14de^4 - 21d^2e^2$

(b) $33f^3g^2 + 11f^2g$

(c) $5x^5y^2 + 3x^2y$

(d) $45pqr^2 - 25p^3qr$

Factorise fully:

(a) $12m^4n^5 - 8m^2n^7$

(b) $a^4b^2c^5 + a^5bc^3$

(c) $42d^4e^2 - 56de^6f$

(d) $km^3n^2p^7 + k^3mn^3p^2$

Factorise fully:

(a) $30x^2y - 12y^2z + 18xyz$

(b) $25a^2bc + 10ab^3 + 35a^3b^2c$

(c) $d^4e^2f - d^3e^5f^2 - d^2e^4f^3$

(d) $4pq^3r + 12q^2rs^3 - 8q^4r^2$

Factorise fully:

(a) $a^{13}b^7 + a^5b^{10} + a^{11}b^8$

(b) $21c^{14}d^8 - 35c^9d^{15}$

(c) $8x^{20}y^4z^7 - 6x^8y^{14}z^9 + 2x^{11}y^7z^5$

Fluency Practice

Factorise fully the following expressions:

(a) $6x - 8$.

(b) $10z^2 + 5z$.

(c) $5x^2 - 20xy$.

(d) $36x^3y + 30xy^2$.

(e) $8ab^2c - 16a^2b^2c$.

(f) $6d^3e - d^4e$.

(g) $\pi r^3 - 2\pi r^2 h$.

(h) $120l^3h - 100h^2l^4$.

(i) $y(2x + 4y) - 6y$.

(j) $8xy(x^2 + y^2) + 2x(yx^3 + y^3)$.

(k) $30d^3e^4 - 15d^2e^3$.

(l) $14b^3c + 28b^3c^2 + 7a^2b^3c$.

(m) $6x^5y^2 - 8y^3x^3 - 10x^8y$.

(n) $5a^{20}b^{17} + 20a^{30}b^{14} - 15a^{20}b^{15}$.

1. $3x + 12$

2. $x^2 + x$

3. $3x^2 + 12x$

4. $x^3 - x$

5. $x^3 + x^2$

6. $7x^3 + 21x^2$

7. $x^3y - x^2$

8. $x^3y + x^2y^2$

9. $2x^3y + 10x^2y^2$

10. $2x^3y^5 - 10x^2y^2$

11. $-2x^3y^5 - 20x^2y^2$

12. $2hx^3y^5 + 10x^2y^2$

13. $15h^4x^3y^5 - 20h^7x^2y^2$

14. $15\pi h^4x^3y^5z + 20\pi h^7x^2y^2$

Purposeful Practice

The length of this rectangle is 4 units.
Its area is $(12x - 8)$ square units.
Find the width of the rectangle.

4

? | Area $= 12x - 8$
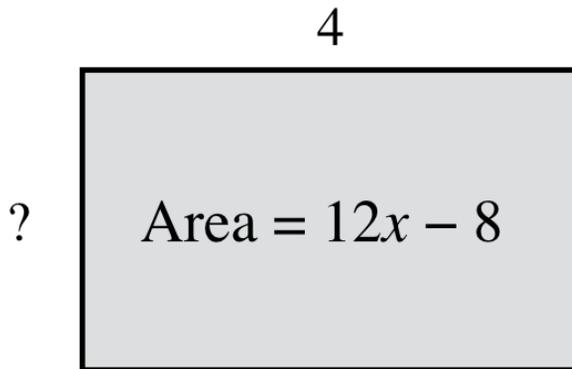
Q5 Simplify and then factorise the following expressions.

[a] $5a - 8b + 13a - 4b$

[b] $7r - 8s + 20s + 8r$

[c] $11m - 4t + 14m - 6t$

Q6 Find and factorise the expression for the area of the following compound shape.

$3r$

7

12

$5s$
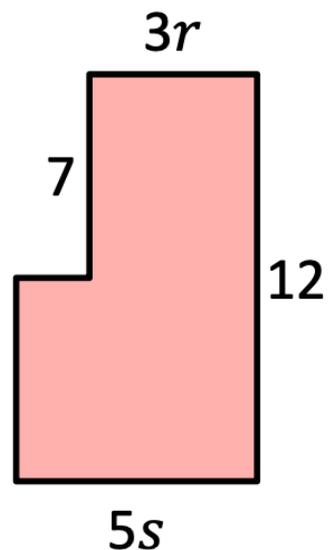
Fluency Practice

Expanding and Factorising

Expand $2(3x-5)$	Expand $4y(y+7)$	Factorise $6b+10$	Factorise a^2-3a
Multiply each term in the bracket by 2: $2(3x-5)$ $=2\times3x-2\times5$ $=\mathbf{6x-10}$	Multiply each term by $4y$: $4y(y+7)$ $=4y\times y+4y\times7$ $=\mathbf{4y^2+28y}$	Find common factors of $6b$ and 10: Common factor is 2 $6b+10=2\times3b+2\times5$ $=\mathbf{2(3b+5)}$	Find common factors of a^2 and $3a$: Common factor is a $a^2-3a=a\times a-3\times a$ $=\mathbf{a(a-3)}$
Expand $4(a+6)$	Expand $3x(x-2)$	Factorise $5x+20$	Factorise x^2+9x
Expand $5(2d-1)$	Expand $5a(4+a)$	Factorise $16-8y$	Factorise d^2-7d
Expand $7(3+4w)$	Expand $2f(f-6)$	Factorise $8w-12$	Factorise $2y^2+3y$
Expand $-4(2x+5)$	Expand $4b(2b+5)$	Factorise $7a+7$	Factorise $6a-5a^2$

Fluency Practice

Q		Answers
1	Expand $2(3x + 5)$	
2	Factorise $6x - 10$	
3	Expand $3(5x + 2)$	
4	Factorise $15 - 6x$	
5	Expand $5(2x + 3)$	
6	Factorise $10x - 6$	
7	Expand $7x(3x + 5)$	
8	Factorise $35x^2 - 21x$	
9	Expand $3x(5x + 7)$	
10	Factorise $15x - 21x^2$	

Q		Answers
11	Expand $2x^2(3x^2 - 5x + 7)$	
12	Factorise $6x^2 + 10x^3 - 14x^4$	
13	Expand $3x^2(5x^2 + 7x - 2)$	
14	Factorise $15x^3 - 21x^2 + 6x^4$	
15	Expand $5x^3(3x^2 - 2x + 7x^4 - 11)$	
16	Factorise $55x^3 - 35x^7 + 10x^4 - 15x^5$	
17	Expand $a(ab + c)$	
18	Factorise $a^2c - ab$	
19	Expand $a^2(ab^3 + cd^4)$	
20	Factorise $a^3b^3 - a^2cd^4$	

Intelligent Practice

Solve the following equations using the balancing method:

1) $2(x + 8) = 41$

2) $2(x + 8) = 43$

3) $2(x - 8) = 43$

4) $3(x - 8) = 43$

5) $3(2x - 8) = 43$

6) $6(x - 4) = 43$

7) $6(x - 4) = 44$

8) $6(x - 4) = 48$

9) $6(4 - x) = 48$

10) $6(4 - x) = 50$

11) $3(4 - x) = 25$

12) $3(4 - 2x) = 25$

13) $-3(2x - 4) = 25$

14) $-3(2x - 4) = -25$

15) $-5(2x - 4) = -25$

16) $-5(-2x - 4) = -25$

17) $5(-2x - 4) = -25$

18) $6(-2x - 4) = -26$

Fluency Practice

Solve the following equations using the balancing method:

1) $2(x + 3) + 4(x + 1) = 22$

2) $7(x - 3) + 5(x + 2) = 37$

3) $3(x - 2) + 2(x - 5) = 14$

4) $2(2x - 1) - 4(3x - 1) = 18$

5) $5(2x + 3) - 6(x - 1) = 29$

6) $4(5x - 2) - 6(3x - 1) = 12$

Fluency Practice

Solve the following equations:

1. $3x + 2(x - 1) = 7$

2. $6 - 3\big(2 - 3(x + 1)\big) = 18$

3. $r\big(6 - 2(r - 1)\big) + 2r^2 + 8 = 0$

4. $x\big(3 - 2(x - 1)\big) + 2\big(x^2 - 3\big) = 0$

5. $4\big(x - 5(x - 3)\big) = 0$

6. $y\big(6 - (y - 3)\big) + \big(y(y - 1) + 2\big) = 0$

7. $4x\big((x + 2) - 3\big) = 4\big(x(x - 2) - 1\big)$

8. $6 - \big(3 - 2\big((x - 1) + 3\big)\big) = 0$

9. $4 = 2\big(2 - 3(4x - 3 + x)\big)$

10. $5 = 6\big(7 - 2\big(3 - (x - 1)\big)\big)$

11. $3\big(5 - \big(2x - 3(x - 2)\big)\big) = 15$

12. $2\big(3x + 2\big(2x - 3(x - 1)\big)\big) = 3x - 2(x - 1)$

13. $7\big(3x + 2\big(2x - 3(x - 1)\big)\big) - 42 = 0$

Intelligent Practice

Which side do you eliminate the variable from?
How would you balance both sides?

1) $2x + 5 = x + 8$

2) $x + 8 = 2x + 5$

3) $8 - x = 2x + 5$

4) $8 - x = 2x - 5$

5) $x + 8 = 2x - 5$

6) $2x + 8 = 4x + 5$

7) $2x + 8 = 5 - 4x$

8) $8 - 2x = 5 - 4x$

9) $8 - 2x = -4x + 5$

10) $8 - 2x = 4x + 5$

Fluency Practice

1 $5x + 3 = 2x + 7$

$(-3)\quad(-3)$

$5x = 2x + 4$

$(-2x)\quad(-2x)$

$\dfrac{3x}{3} = \dfrac{4}{3}$

$x = \dfrac{4}{3}$

2 $7x + 4 = 3x + 9$

$7x = 3x + 5$

$4x = 5$

3 $3x + 12 = x + 15$

$3x = x + 3$

4 $2x + 11 = x + 13$

5 $5x - 3 = 2x + 7$

$5x = 2x + 10$

$3x = 10$

$x = \dfrac{10}{3}$

6 $7x - 6 = 3x + 9$

$7x = 3x + 15$

$4x = 15$

7 $3x - 12 = x - 15$

$3x = x - 3$

8 $2x + 11 = x - 13$

9 $5x + 3 = -2x + 7$

$5x = -2x + 4$

$7x = 4$

$x = \dfrac{4}{7}$

10 $7x + 6 = -3x + 9$

$7x = -3x + 3$

$10x = 3$

11 $3x + 12 = -x + 15$

$3x = -x + 3$

12 $2x + 11 = -x - 13$

13 $-5x + 3 = -2x + 7$

$-5x = -2x + 4$

$-3x = 4$

$x = -\dfrac{4}{3}$

14 $-7x + 6 = -3x + 9$

$-7x = -3x + 3$

$-4x = 9$

15 $-3x + 12 = -x + 15$

$-3x = -x + 3$

16 $-2x + 11 = -x - 13$

Fluency Practice

Click here   Scan here

Question 1:   Solve the following equations

(a) $4x + 1 = 2x + 7$

(b) $5x + 4 = 3x + 16$

(c) $2x + 8 = x + 12$

(d) $7x + 1 = 2x + 46$

(e) $6x - 3 = 2x + 13$

(f) $9x - 10 = 7x + 24$

(g) $2x + 21 = 4x + 5$

(h) $x + 2 = 5x - 2$

(i) $6x - 9 = 4x - 1$

(j) $5x + 2 = 16 - 2x$

(k) $3x - 1 = 23 - x$

(l) $6x + 8 = 38 - 4x$

(m) $80 - x = 8x - 1$

(n) $2x + 7 = 17 - 8x$

(o) $15 - x = 27 - 3x$

(p) $12x - 20 = 15x - 38$

(q) $35x + 10 = 20x + 175$

(r) $14x = 2x + 60$

Question 2:   Solve the following equations

(a) $3x + 3 = x + 8$

(b) $9x + 10 = 7x + 39$

(c) $3x + 1 = 7x - 17$

(d) $x + 4 = 13 - x$

(e) $16x + 3 = 6x + 24$

(f) $9x + 12 = 6x + 14$

(g) $7x + 24 = 12x - 12$

(h) $2x + 9 = 48 - 6x$

(i) $34 - 12x = 28x - 36$

Question 3:   Solve the following equations

(a) $4x + 15 = x + 3$

(b) $8x + 40 = 3x + 5$

(c) $9x + 7 = 11x + 20$

(d) $7x + 9 = 2x - 16$

(e) $9x - 70 = 2x - 91$

(f) $4 - 5x = 3x + 28$

(g) $10x + 136 = -8 - 2x$

(h) $-6x + 2 = -4x + 10$

(i) $-11x - 4 = -3x + 60$

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Question 4: Solve the following equations

(a) $5(x + 3) = 3(x + 9)$ (b) $8(x - 1) = 4(x + 3)$ (c) $3(x + 13) = 10(x - 1)$

(d) $2(4x - 3) = 5(2x - 5)$ (e) $9(2x - 5) = 3(4x + 7)$ (f) $2(9 - x) = 3(x + 16)$

(g) $5(2x + 9) + 2(x + 11) = 3(3x + 4) + 46$

(h) $8(x - 2) - 3(1 - x) = 9(x + 2) + 1$

Apply

Question 1: Shown is a rectangle

(a) Explain why 9x + 12 = 4x + 47

(b) Find x

9x + 12

4x + 47
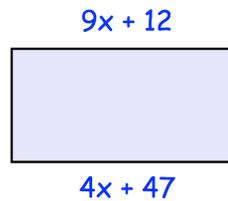
Question 2: Shown is an isosceles triangle

(a) Explain why 4x + 15 = 33 − 2x

(b) Find x

(c) Find the perimeter of the isosceles triangle

4x + 15   33 - 2x

5x
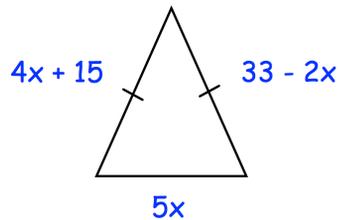
Question 3: Explain why 8x + 3 = 2(4x + 1) has no solution.

Question 4: (a) Find the value of x

(b) Find the value of y

4
x
x
x
x

31
x

y
1
x
x
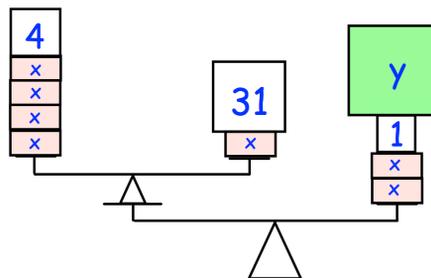
* The mass of the balances are very small, so may be ignored

Question 5: Shown below is a function machine.
The input and output have the same value.

input   output

x → Multiply by 8 → Add 42 →
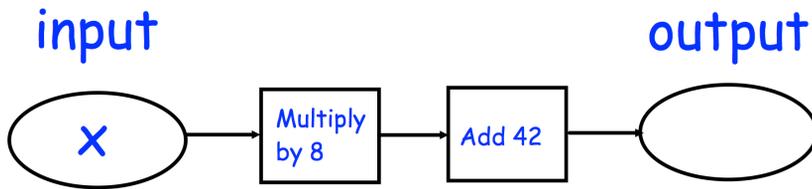
(a) Write an equation in terms of x.

(b) Solve the equation to find the value of x.

Question 6: Toby has completed his homework.
Can you spot any mistakes?

(a)
Solve $7x - 5 = 5x + 23$

     $-5x$ $-5x$

     $2x - 5 = 23$

       -5 -5

       $2x = 18$

       $\div 2$ $\div 2$

         $x = 9$

(b)
Solve $3x + 11 = 41 - 2x$

     $-2x$ $-2x$

     $x + 11 = 41$

        -11 -11

          $x = 30$

Answers

✔ ✘

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Intelligent Practice

Solve the following equations using the balancing method:

1) $5x + 7 = 2x + 13$

2) $9x + 5 = 7x + 15$

3) $7x + 3 = 2x + 28$

4) $10x + 19 = 9x + 9$

5) $7x + 33 = 4x + 18$

6) $3x + 85 = 12x + 4$

7) $2x + 21 = 6x + 5$

8) $6x + 11 = 3x - 4$

9) $6x + 19 = 10x - 5$

10) $8x - 7 = 3x - 32$

11) $7 - 2x = 23 - 4x$

12) $2 - 5x = 110 - 14x$

13) $3 - 6x = 7 - 2x$

14) $17 - 18x = 81 - 10x$

15) $2x + 3 = 10 + 2x$

Fluency Practice

Solve these equations.

(a) $5x = 2x + 18$

(b) $6x = x + 10$

(c) $8x = 2x + 30$

(d) $7x = 3x - 16$

(e) $5x = 3x + 11$

Solve these equations.

(a) $5x - 14 = 3x$

(b) $7x - 6 = 4x$

(c) $2x - 7 = x$

(d) $7x + 4 = 5x$

(e) $6x + 15 = 4x$

Solve these equations.

(a) $2x - 3 = 5x$

(b) $3x + 11 = 4x$

(c) $5x - 12 = 8x$

(d) $44 + 3x = 7x$

(e) $x - 9 = 2x$

Solve these equations.

(a) $25 - 2x = 3x$

(b) $4x = 7 - 3x$

(c) $-6x = 15 - x$

(d) $20 - 6x = 2x$

(e) $35 - 4.5x = 0.5x$

(f) $-4x + 11 = x$

(g) $3.5x = 16.5 - 2x$

(h) $43 - x = 3x$

(i) $7x = -5x + 6$

(j) $-9 - 4x = -2x$

Purposeful Practice

Create an equation by filling the boxes with 2 of the expressions below. Solve your equation – hopefully you get one of the answers from the right hand side of the page!

$$\boxed{} = \boxed{}$$
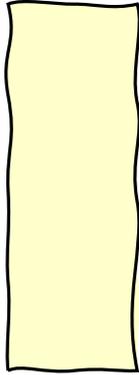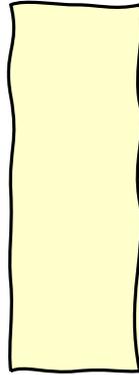
$8x + 11$		$6x - 1$
$9x + 2$		$x + 9$
$7x + 5$		$8x + 10$
$4x + 17$		$3x + 14$
$2x + 10$		$4x - 9$
$5x - 3$		$5x + 1$

	$5x - 14$
	$3x + 16$
	$5x + 4$
	$9x - 6$
	$5x + 7$
	$2x + 11$

Try to create an equation with one of the solutions below!

$x = 1$
$x = 2$
$x = 3$
$x = 4$
$x = 5$
$x = 10$
$x = -1$
$x = -2$
$x = -3$

Purposeful Practice

Pick two expressions from the cards below and put them equal to each other. Solve.

$3x + 10$	$2x - 5$
$16 + x$	$6x$
$5x + 12$	$5 + 2x$
$4x - 4$	$-2x + 12$
$5 - x$	$10 - 3x$

Equations with integer solution:	Equations with fractional solution:

There is one pair of expressions that create an unsolvable equation. Can you find them?

Intelligent Practice

Solve the following equations using the balancing method:

1) $3(x + 3) = 3(2x - 4)$

2) $2(3 + x) = 3(2x - 4)$

3) $-2(3 + x) = 3(2x - 4)$

4) $-2(3 + x) = -3(2x - 4)$

5) $-3(3 - x) = 3(2x - 4)$

6) $3(-3 - x) = 6(2x - 4)$

7) $3(x - 5) - 5 = 5(x + 6)$

8) $7(x + 6) - 1 = 4(x + 2)$

9) $6(x + 2) = 24 - 3(x - 5)$

10) $5(6 - x) - 3 = 5 - 3(x - 2)$

Fluency Practice

Solve the following equations using the balancing method:

1) $5(2s - 8) + 1 = 3(s + 15)$

2) $6(7 - w) - 5 = w - 40$

3) $5(d + 1) + 1 = 3(d - 3) - 1$

4) $5(q - 1) - 10 = 2(5 - q) + 3$

5) $7(y - 1) - 29 = y + 30$

6) $4(k - 2) + 4 = k - 1$

7) $3(3m - 1) - 10 = 2(2m + 1) + 5$

8) $9(k - 1) - 9 = 4(k + 2) + 4$

9) $4(t - 2) + 4 = 2(t + 2) - 2$

10) $9(p - 2) - 15 = 3(p + 3) + 18$

Intelligent Practice

Solve the following equations using the balancing method:

1) $\dfrac{2}{x} - 6 = 9$

2) $\dfrac{2}{x} - 7 = 9$

3) $\dfrac{3}{x} - 7 = 9$

4) $\dfrac{3}{x} + 7 = 9$

5) $7 + \dfrac{3}{x} = 9$

6) $7 - \dfrac{3}{x} = 9$

7) $\dfrac{3}{x-1} = 9$

8) $\dfrac{3}{2x-1} = 9$

9) $\dfrac{3}{2(x-1)} = 9$

10) $\dfrac{2}{3(x-1)} = 9$

Question 6:   Solve the equations below

(a) $\dfrac{2x + 1}{3} = x - 2$

(b) $\dfrac{5x - 3}{2} = 2x + 4$

(c) $\dfrac{x + 17}{5} = x + 1$

(d) $4x - 9 = \dfrac{2x + 3}{3}$

(e) $\dfrac{9 - x}{2} = x + 3$

(f) $\dfrac{15 - 2x}{3} = 2x - 3$

Question 7:   Solve the equations below

(a) $\dfrac{2x - 1}{x + 3} = 9$

(b) $\dfrac{x + 11}{2x - 5} = 2$

(c) $\dfrac{x + 1}{x + 4} = 3$

(d) $\dfrac{5x - 24}{x - 4} = 3$

(e) $\dfrac{x + 7}{x - 3} = -4$

(f) $\dfrac{3x + 8}{9 - x} = -2$

$$\frac{x + 3}{2} + \frac{x + 1}{4} = 10$$

$$\frac{x + 3}{10} + \frac{x - 2}{5} = 2$$

$$\frac{2x - 1}{9} + \frac{x + 2}{3} = 0$$

$$\frac{x - 1}{4} - \frac{x + 3}{2} = -4$$

$$\frac{4x + 9}{15} - \frac{x - 3}{5} = 1$$

$$\frac{x + 4}{3} + \frac{x + 1}{2} = 1$$

$$\frac{3x + 5}{4} - \frac{x - 7}{5} = 1$$

$$\frac{2x - 5}{7} - \frac{2x - 1}{2} = 3$$

$$\frac{x}{2} + \frac{4x + 1}{10} = -8$$

$$\frac{x + 1}{2} + \frac{2x - 1}{4} + \frac{x + 2}{3} = 1$$

Answers

✓ ✗

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Fluency Practice

Q	Solve the linear equation:	Answers
1	$\dfrac{x}{6} = 2$	
2	$\dfrac{6}{x} = 2$	
3	$\dfrac{x}{2} = 6$	
4	$\dfrac{2}{x} = 6$	
5	$\dfrac{x}{20} = 5$	
6	$\dfrac{20}{x} = 5$	
7	$\dfrac{x}{5} = 20$	
8	$\dfrac{5}{x} = 20$	

Q	Solve the linear equation:	Answers
9	$\dfrac{x+3}{12} = 4$	
10	$\dfrac{12}{x+3} = 4$	
11	$\dfrac{x-3}{4} = 12$	
12	$\dfrac{4}{x-3} = 12$	
13	$\dfrac{3x-5}{8} = 2$	
14	$\dfrac{8}{3x-5} = 2$	
15	$\dfrac{ax+b}{c} = d$	
16	$\dfrac{c}{ax-b} = d$	

Intelligent Practice

Are the following equations ready to be cross multiplied?

1) $\dfrac{x}{5} + 2 = \dfrac{4}{5}$

2) $\dfrac{2x}{5} + 2 = \dfrac{4}{5}$

3) $\dfrac{x}{5} = \dfrac{4}{5}$

4) $\dfrac{2x}{5} = \dfrac{4}{5}$

5) $\dfrac{x}{5} = 4$

6) $\dfrac{x}{5} + 2 = 4$

7) $\dfrac{x+2}{5} = 4$

8) $\dfrac{2x}{5} + 1 = \dfrac{4}{5}$

9) $\dfrac{5}{2x} + 1 = \dfrac{4}{5}$

10) $\dfrac{5}{2x+1} = \dfrac{4}{5}$

11) $\dfrac{5}{2x} + 1 = \dfrac{4}{5x}$

12) $\dfrac{5}{2x+1} = \dfrac{4}{5x}$

Intelligent Practice

Solve the following equations using cross multiplication:

1) $\dfrac{x}{7} = \dfrac{3}{2}$

2) $\dfrac{2x}{7} = \dfrac{3}{2}$

3) $\dfrac{2x}{7} = \dfrac{3}{14}$

4) $\dfrac{2x}{14} = \dfrac{3}{14}$

5) $\dfrac{2x}{14} = \dfrac{3}{7}$

6) $\dfrac{14}{2x} = \dfrac{7}{3}$

7) $\dfrac{14}{2x+1} = \dfrac{7}{3}$

8) $\dfrac{14}{2x-1} = \dfrac{7}{3}$

9) $\dfrac{7}{2x-1} = \dfrac{7}{3}$

10) $\dfrac{2x-1}{7} = \dfrac{7}{3}$

11) $\dfrac{2x-1}{6} = \dfrac{7}{3}$

12) $\dfrac{1-2x}{6} = \dfrac{7}{3}$

Question 1:   Solve each equation below

(a) $\dfrac{x}{7} = \dfrac{3}{2}$ (b) $\dfrac{a}{6} = \dfrac{3}{10}$ (c) $\dfrac{c}{20} = \dfrac{7}{8}$ (d) $\dfrac{w}{13} = \dfrac{3}{4}$

(e) $\dfrac{7}{10} = \dfrac{c}{8}$ (f) $\dfrac{4}{5} = \dfrac{d}{9}$ (g) $\dfrac{2}{11} = \dfrac{5}{h}$ (h) $\dfrac{14}{p} = \dfrac{3}{20}$

(i) $\dfrac{2a}{5} = \dfrac{3}{2}$ (j) $\dfrac{5x}{11} = \dfrac{9}{2}$ (k) $\dfrac{4a}{9} = \dfrac{6}{5}$ (l) $\dfrac{7}{4} = \dfrac{2y}{3}$

(m) $\dfrac{25}{4y} = \dfrac{1}{10}$ (n) $\dfrac{35}{8} = \dfrac{5w}{12}$ (o) $\dfrac{10}{17} = \dfrac{9}{10w}$ (p) $\dfrac{1}{3y} = \dfrac{2}{5}$

Question 2:   Solve the following equations

(a) $\dfrac{x+1}{5} = \dfrac{3}{2}$ (b) $\dfrac{x+3}{4} = \dfrac{2}{3}$ (c) $\dfrac{2x+1}{5} = \dfrac{7}{2}$

(d) $\dfrac{3x-1}{5} = \dfrac{x+11}{2}$ (e) $\dfrac{x+3}{4} = \dfrac{2x-1}{7}$ (f) $\dfrac{3x-4}{3} = \dfrac{2x-1}{4}$

(g) $\dfrac{2}{3x-5} = \dfrac{1}{x+8}$ (h) $\dfrac{x+2}{2x+3} = \dfrac{1}{5}$ (i) $\dfrac{9}{4} = \dfrac{2x+1}{x-1}$

$\dfrac{2}{x+2} = \dfrac{x+1}{3}$ $\dfrac{x+1}{3} = \dfrac{1}{x-1}$ $\dfrac{4}{x+5} = \dfrac{x-2}{2}$

$\dfrac{x-3}{2} = \dfrac{2}{2x+1}$ $\dfrac{5}{2x+3} = \dfrac{3x+1}{2}$ $\dfrac{2}{7x-1} = \dfrac{x+3}{12}$

Answers

Fluency Practice

Solve the following equations using the balancing method:

1) $\dfrac{3x-5}{5} = \dfrac{2x+4}{7}$

2) $\dfrac{4x-1}{3} = \dfrac{3x-2}{2}$

3) $\dfrac{2(x+3)}{5} = \dfrac{3x-2}{2}$

4) $\dfrac{14}{2x-1} = \dfrac{7}{3x-2}$

5) $\dfrac{6}{2x-1} = \dfrac{7}{3x-2}$

6) $\dfrac{6}{1-2x} = \dfrac{12}{7x-14}$

7) $\dfrac{3}{7x-1} = \dfrac{5}{13-14x}$

Purposeful Practice

$2x + 3 = 117$

$2x + 3 = 17 + x$

$2x + 3 = 17 - x$

$2(x + 3) = 17$

$\dfrac{x + 3}{2} = 17$

$2x + 3 = 17$

$17 = 2x + 3$

$2x + 3 = -17$

$2x - 3 = 17$

$3 - 2x = 17$

$\dfrac{1}{2x + 3} = \dfrac{1}{17}$

$x = 0$
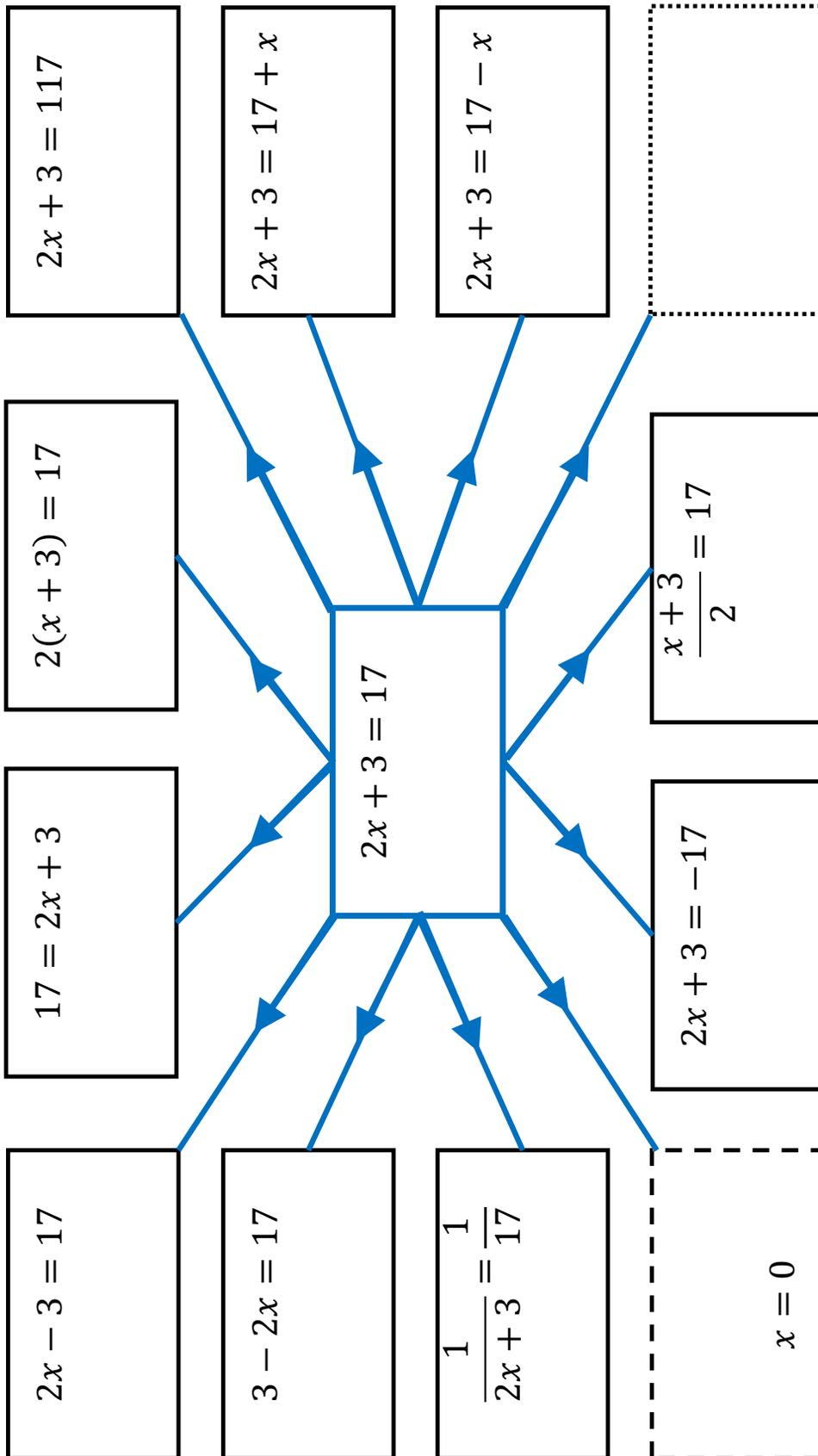
Fluency Practice

Solving Linear Equations

Solve $5y - 1 = 19$ $5y - 1 = 19$ $+1 \qquad +1$ $5y = 20$ $\div 5 \qquad \div 5$ $y = 4$	Solve $3 + 2a = 15$ $3 + 2a = 15$ $-3 \qquad -3$ $2a = 12$ $\div 2 \qquad \div 2$ $a = 6$	Solve $4(y - 1) = 30$ Expand the brackets: $4y - 4 = 30$ $+4 \qquad +4$ $4y = 34$ $\div 4 \qquad \div 4$ $y = 8.5$	Solve $6x = 3x - 12$ $6x = 4x - 12$ $-4x \qquad -4x$ $2x = -12$ $\div 2 \qquad \div 2$ $x = -6$
Solve $6a - 5 = 25$	Solve $7x + 4 = 32$	Solve $3(w + 5) = 36$	Solve $5b = b + 8$
Solve $42 = 5b - 3$	Solve $27 = 2d + 10$	Solve $18 = 6(1 + y)$	Solve $2y + 7 = 9y$
Solve $5x - 2 = 13$	Solve $6y + 1 = 37$	Solve $7(5 + x) = 21$	Solve $7t = 5t - 11$

Fluency Practice

Solving Linear Equations

(a) Solve $2x + 5 = 6$

(b) Solve $4x + 5 = x + 14$

(c) Solve $6x + 1 = 8 - x$

(d) Solve $10 + 5x = 3x + 6$

(e) Solve $6x + 2 = 2x + 5$

(f) Solve $5x - 4 = 1 + 6x$

(g) Solve $2(3x + 11) = 10$

(h) Solve $2(x - 2) = 3(x + 4)$

(i) Solve $4(3x - 1) + 6 = 5(2x + 4)$

Fluency Practice

Solve these equations.
(a) $3(x + 1) = 18$
(b) $3(x - 1) = 18$
(c) $4(x - 3) = 8$
(d) $10 = 2(x + 7)$
(e) $5(x - 2) = 8$
(f) $25 = 4(x + 4)$

Solve these equations.
(a) $3(x + 1) = 2x$
(b) $4x = 6(x - 3)$
(c) $4(x + 5) = x + 2$
(d) $4(x - 1) = 2x + 5$
(e) $2(x + 5) = x - 3$
(f) $3x - 1 = 2(3x + 4)$

Solve these equations.
(a) $3(x + 1) = 2(x + 4)$
(b) $3(x - 1) = 2(x + 4)$
(c) $4(x - 1) = 2(x + 4)$
(d) $4(x - 3) = 2(x - 1)$
(e) $5(x + 1) = 2(2x + 5)$
(f) $2(x - 1) = 7(x + 4)$
(g) $3(x - 1) = 4(x + 2)$
(h) $3(2x - 1) = 8(x + 2)$

Solve these equations.
(a) $3(x + 1) + 2(x + 4) = 1$
(b) $3(x - 1) + 2x = 12$
(c) $5x + 2(x + 3) = 41$
(d) $4(x + 2) - 2(x + 1) = 2$
(e) $5(x + 3) - 3(x - 1) = 30$
(f) $3 = 7(x - 3) - 2(x - 1)$

Fluency Practice

Solve:

(a) $2(x + 3) = 16$ (b) $3(x - 1) = 9$

(c) $20 = 5(x + 1)$ (d) $2(3 + x) = 8$

(e) $3(x - 4) = 18$ (f) $5(x - 0.5) = 15$

(g) $2(x + 6) = -2$ (h) $4(x - 1) = 6$

(i) $7 = 2(x - 5)$ (j) $-8(x + 4) = 16$

Solve:

(a) $\frac{2x+3}{3} = 5$ (b) $\frac{3x-2}{7} = 1$

(c) $6 = \frac{4x+2}{3}$ (d) $\frac{5+2x}{6} = 2$

(e) $\frac{3x-6}{5} = 1.5$ (f) $\frac{5x-6}{4} = -3$

(g) $1 = \frac{4x-2}{3}$ (h) $\frac{14+3x}{5} = 2$

(i) $\frac{2x-9}{3} = \frac{1}{2}$ (j) $4.8 = \frac{2x-1}{3}$

Solve:

(a) $\frac{3x}{2} + 1 = 10$ (b) $\frac{5x}{6} - 2 = 3$

(c) $2 + \frac{3x}{4} = 8$ (d) $\frac{3x}{5} + 1.2 = 4.8$

(e) $\frac{2x}{3} + 5 = 1$ (f) $\frac{2x}{5} - 4 = 0$

(g) $5 = \frac{2x}{9} - 7$ (h) $\frac{5x}{2} + 5 = 1.5$

(i) $\frac{1}{4} + \frac{2x}{5} = \frac{3}{4}$ (j) $2 + \frac{2x}{3} = -1$

Solve:

(a) $5(4 + x) = 18$ (b) $\frac{5x}{4} + 8 = 7$

(c) $\frac{3-2x}{7} = 3$ (d) $0 = 6(x - 4)$

(e) $1 = \frac{0.5x-4}{5}$ (f) $2(x + 3) = -1$

(g) $50 = 4(x - 7)$ (h) $0.2 = \frac{2x}{4} - 6.3$

Fluency Practice

Solving Equations with Fractions

(a)

Solve $\dfrac{3}{y+1} = 4$

(b)

Solve $-2 = \dfrac{5}{8+x}$

(c)

Solve $\dfrac{6}{3a-4} = 2$

(d)

Solve $\dfrac{2}{3} = \dfrac{6}{1-4h}$

(e)

Solve $\dfrac{3}{4-d} = \dfrac{5}{d}$

(f)

Solve $\dfrac{2}{w} = \dfrac{7}{w-3}$

(g)

Solve $\dfrac{1}{t+5} = \dfrac{5}{1-3t}$

(h)

Solve $\dfrac{4}{2b-1} = \dfrac{9}{5b+2}$

(i)

Solve $\dfrac{-10}{2f+3} = \dfrac{3}{f-1}$

(j)

Solve $\dfrac{x}{2x+5} = 3$

(k)

Solve $-3 = \dfrac{p-1}{5+3p}$

(l)

Solve $\dfrac{5}{8} = \dfrac{2-3y}{1-6y}$

Fluency Practice

section (i)

(1) $20 - x = \frac{1}{3}x$

(2) $\frac{1}{2}x = 12 - x$

(3) $\frac{1}{2}x = \frac{1}{3}x + 5$

(4) $7(\frac{1}{2}x + 6) = 14x$

(5) $4(\frac{1}{3}x + 8) = 12x$

(6) $\frac{1}{2}x = 3(2x - 11)$

(7) $4(3x - 35) = \frac{1}{3}x$

(8) $\frac{1}{3}x + 2 = \frac{1}{2}x + 1$

section (ii)

(1) $\frac{1}{3}x + 5 = \frac{1}{2}x + 3$

(2) $\frac{1}{4}x + 3 = \frac{1}{2}x + 1$

(3) $\frac{1}{3}x - 2 = \frac{1}{5}x + 2$

(4) $\frac{1}{3}x - 18 = \frac{1}{4}x - 13$

(5) $20 - \frac{1}{3}x = 15 - \frac{1}{2}x$

(6) $\frac{1}{2}x - 11 = \frac{1}{11}x + 7$

(7) $\frac{1}{6}x + 4 = \frac{1}{3}x - 2$

(8) $\frac{1}{4}x - 7 = \frac{1}{5}x - 5$

section (iii)

(1) $\frac{3(2x + 3)}{5} = 3(x - 3)$

(2) $\frac{3x + 2}{4} = \text{½}x + 3$

(3) $5(\frac{1}{3}x + 1) = 3(\frac{1}{2}x + 2) + 1$

(4) $\frac{1}{2}(\frac{1}{6}x - 1) = \frac{1}{5}(\frac{1}{3}x - 1)$

(5) $\frac{1}{2}(\frac{1}{5}x - 1) = \frac{1}{5}(\frac{1}{3}x + 2)$

(6) $\frac{2x - 1}{5} + 3 = \frac{5x - 2}{3} + 1$

Fluency Practice

Solve these equations.

(a) $3x + 1 = 2x + 9$

(b) $4x + 1 = 2x + 9$

(c) $1 + 4x = x + 10$

(d) $4x - 3 = x + 15$

(e) $4x + 7 = 2x - 1$

(f) $6x + 5 = 10 + 4x$

Solve these equations.

(a) $2x + 1 = 7x + 16$

(b) $3x - 2 = 9x + 10$

(c) $x - 8 = 4x + 7$

(d) $5x + 14 = 8x - 1$

(e) $9 + 4x = 6x - 2$

(f) $x - 7 = 5x - 5$

Solve these equations.

(a) $6 + 2x = 11 - 3x$

(b) $7x - 3 = 12 - 3x$

(c) $1 - 4x = 5 + 4x$

(d) $11 - x = 7 - 2x$

(e) $6.5 - 5x = 2.5x - 4$

(f) $-3x - 7 = 11 - 8x$

(a) The rectangle shown has opposite sides of length $(2x + 5)\ cm$ and $(4x - 3)\ cm$. Find the value of x and hence its area.
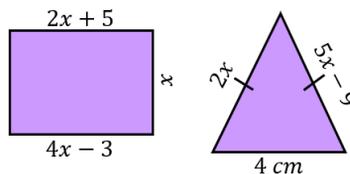
(b) Given that the triangle shown is isosceles, find the value of x and hence its perimeter.

Fluency Practice

Solve

(a) $\dfrac{x+2}{5} = 4$ 　　(b) $\dfrac{x-1}{6} = 2$

(c) $\dfrac{6x+3}{9} = 1$ 　　(d) $\dfrac{5x-6}{4} = 1$

(e) $\dfrac{2x+10}{5} = 4$ 　　(f) $\dfrac{2x-1}{8} = 3$

(g) $1 = \dfrac{2x-1}{5}$ 　　(h) $9 = \dfrac{5x-3}{3}$

Solve

(a) $\dfrac{2x+3}{5} = x$ 　　(b) $\dfrac{4x-7}{2} = x$

(c) $\dfrac{x+3}{5} = \dfrac{x-1}{3}$ 　　(d) $\dfrac{2x+1}{4} = \dfrac{3x-1}{2}$

(e) $\dfrac{4x}{7} = \dfrac{2x-1}{5}$ 　　(f) $\dfrac{5x+3}{5} = \dfrac{x+3}{2}$

Solve

(a) $\dfrac{x}{5} - 2 = 3$ 　　(b) $\dfrac{x}{4} + 7 = 5$

(c) $\dfrac{x+1}{4} - 1 = 5$ 　(d) $\dfrac{x-2}{3} + 2 = 6$

(e) $\dfrac{2x+8}{5} - 7 = 1$ 　(f) $1 = \dfrac{3x}{4} + 7$

Ben is x cm tall. Talia is 8 cm taller than Ben. Belle is 2cm shorter than Ben. Their mean height is 160 cm. Find Ben's height.

A triangle has base $(2x + 9)$ cm and height 4 cm. Its area is 42 cm^2. Find the value of x and hence the base of the triangle.

Purposeful Practice

Creating & Solving

Write an equation for each description.
The first one has been done for you.
Solve to find x.

I think of a number… x	Equation	$x =$
I multiply it by 3 and add 5. The answer is 14.	$3x + 5 = 14$	
I subtract 5 from it. The answer is 8.		
I multiply it by 4 and subtract 4. The answer is 10.		
I divide it by 4. The answer is 8		
I multiply it by 5. The answer is 10.		
I subtract 5 and divide by 2. The answer is 14		
I multiply it by 4 and divide by 5. The answer is 10		
I multiply it by 2 and subtract 10. The answer is 8.		
I add 8 and divide 4. The answer is 14.		
I multiply by 3, add 6, then divide by 3. The answer is 10.		
I add 3 and multiply by 4. The answer is 8.		
I add 2, multiply by 7 and then divide by 2. The answer is 14.		
I divide by 4, then add 6. The answer is 8.		

Purposeful Practice

Algebraic Ages

1)

Amy is a years old.   Zack is 5 years older than Amy.

a) Use a to describe Zack's age.
b) If Zack is 12 years old, write an equation to find a.
c) Solve the equation to find Amy's age.

2)

Bill is b years old.   Vicky is 3 times Bill's age.

a) Use b to describe Vicky's age.
b) If Vicky is 24 years old, write an equation to find b.
c) Solve the equation.

3)

Cathy is c years old.   Trey is 18 years younger than Cathy.

a) Use c to describe Trey's age.
b) If Trey is 38 years old, write an equation to find c.
c) Solve the equation.

4)

David is d years old.   Mae is a fifth as old as David.

a) Use d to describe Mae's age.
b) If Mae is 2 years old, write an equation to find d.
c) Solve the equation.

5)

Elise is e years old.   Yarik is double Elise's age.   Will is 6 years older than Yarik

a) If Will is 14 years old, write an equation to find e.
b) Solve the equation.

6)

Frey is f years old.   Henry is triple Frey's age.   Jane is 15 years younger than Henry.

a) If Jane is 21 years old, write an equation to find f.
b) Solve the equation.
c) How old is Henry?

7)

Greg is g years old.   Pete is 9 years older than Greg.

The total age of Greg & Pete is 57.
a) Form & solve an equation to find Greg's age.

8)

Hannah is h years old.   Jess is 5 times Hannah's age.   Kelly is 10 years younger than Jess.

a) If their total age is 45, how old is each person?

Purposeful Practice

Question 1:   I think of a number.
I multiply the number by 3 and then add 5.
The answer is 29.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 2:   I think of a number.
I multiply the number by 5 and then subtract 2.
The answer is 58.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 3:   I think of a number.
I divide the number by 2 and then add 1.
The answer is 7.

(a) Form an equation in terms of x.
(b) Solve the equation to find the original number.

Question 4:   Gregory is x years old.
Daisy is 2 years older than Gregory
The sum of their ages is 40.

(a) Form an equation in terms of x
(b) Solve the equation and work out Gregory's and Daisy's ages.

Question 5:   Robert is x years old.
Hannah is 7 years younger than Robert
The sum of their ages is 61.

(a) Form an equation in terms of x
(b) Solve the equation and work out Robert's and Hannah's ages.

Question 6:   Michael is x years old.
Jenny is twice as old as Michael
The sum of their ages is 57.

(a) Form an equation in terms of x
(b) Solve the equation and work out Michael's and Jenny's ages.

Question 7: Fiona is x years old.
Thomas is 3 years older than Fiona.
Cara is twice as old as Fiona.
The sum of their ages is 51.

(a) Form an equation in terms of x
(b) Solve the equation and work out Fiona's, Thomas's and Cara's ages.

Question 8: Alan is x years old.
Barry is ten years younger than Alan.
Kevin is double Alan's age.
The sum of their ages is 54.

(a) Form an equation in terms of x
(b) Solve the equation and work out Alan's, Barry's and Kevin's ages.

Question 9: Rebecca is x years old.
Mary is 8 years older than Rebecca.
Jill is three times older than Mary.
The sum of their ages is 67.

(a) Form an equation in terms of x
(b) Solve the equation and work out Rebecca's, Mary's and Jill's ages.

Question 10: Andy has x pence.
Kelly has 7 pence more than Andy.
Georgia has 9 pence less than Andy.
The total amount of money they have is £1.48

(a) Form an equation in terms of x
(b) Solve the equation and work out how much money each has.

Question 11: Billy has x pounds.
Liam has twice as much money as Billy.
Nicola has three times as much money as Liam.
The total amount of money they have is £180

(a) Form an equation in terms of x
(b) Solve the equation and work out how much money each has.

Question 12: Farmer Jones has x sheep
Farmer Smith has 100 more sheep than Farmer Jones.
Farmer White has twice as many sheep as Farmer Jones.
In total there are 2500 sheep.

(a) Form an equation in terms of x
(b) Solve the equation and work out how many sheep each farmer has.

Question 13: The cost of a TV is £x
The cost of a DVD player is £45 less than a TV.
The total cost of the TV and DVD player is £235

(a) Form an equation in terms of x
(b) Find the cost of a TV

Question 14: The sum of three consecutive numbers is 51.

(a) Form an equation in terms of x
(b) Solve the equation and work out each number.

Question 15: The sum of five consecutive numbers is 110.

(a) Form an equation in terms of x
(b) Solve the equation and work out each number.

Question 16: A rectangular field is 7 metres longer than wide.
The perimeter of the field is 106m.

(a) Find the dimensions of the field.
(b) Find the area of the field.

Question 17: A rectangular field is 20 metres longer than wide.
The perimeter of the field is 280m.

(a) Find the dimensions of the field.
(b) Find the area of the field.

Fluency Practice

Angles on One Side of a Straight line

not drawn accurately

①
$(a + 10)°$
70°

②
120°
$(b - 25)°$

③
85°
$(c + 35)°$
35°

④
95°
$(d - 8)°$
65°
75°

⑤
110°
$2e°$

⑥
30°
$3f°$

⑦
35°
85°
$\dfrac{g°}{2}$

⑧
90°
$3h°$
$2h°$
15°

⑨
$(i + 40)°$
$i°$

⑩
$(j + 55)°$
$2j°$
35°

⑪
85°
$(k + 15)°$
$(2k + 20)°$

⑫
$(4l + 35)°$
$(l + 15)°$
$(9l - 10)°$
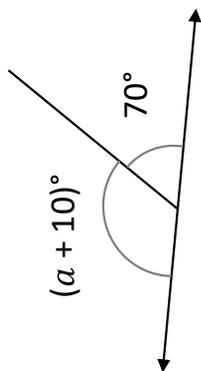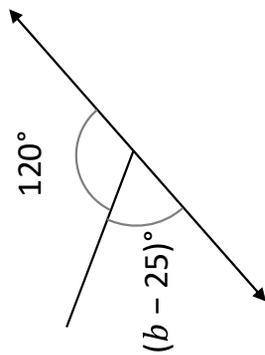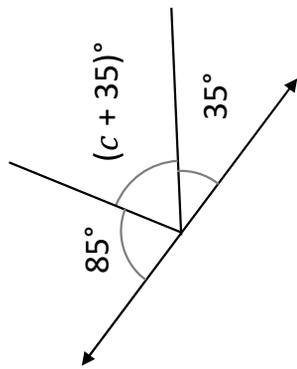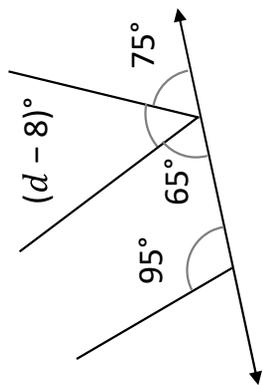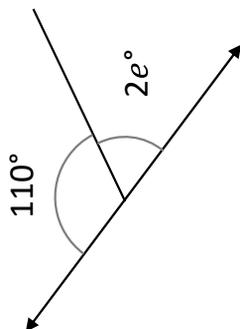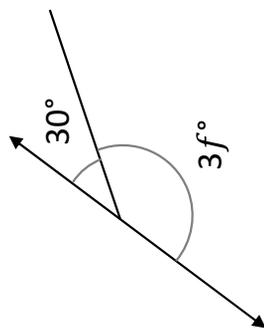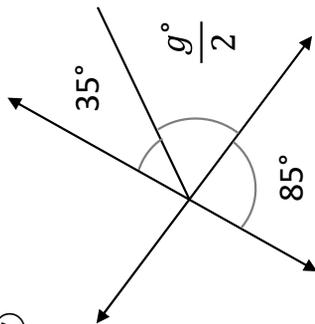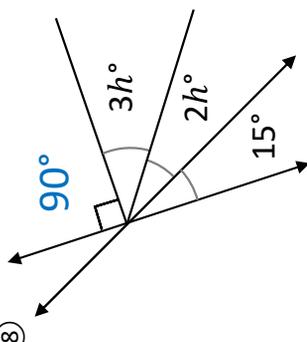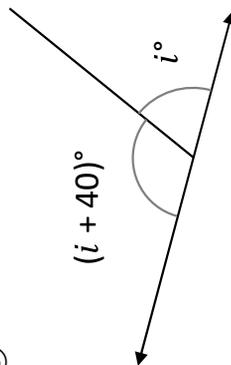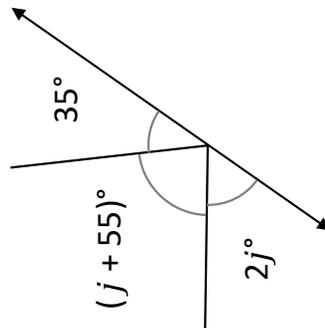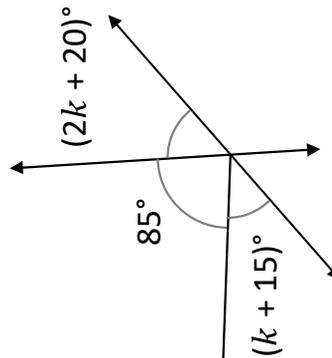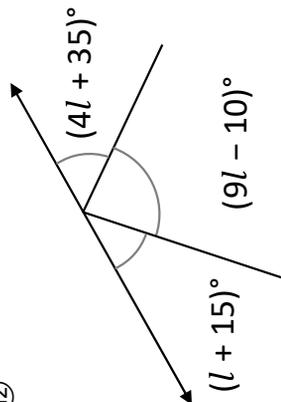
11 Answers

85		15	100	70	50	25
30		48	20	35	120	

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Fluency Practice

Vertically Opposite Angles: Forming Equations

Find the value of each variable.
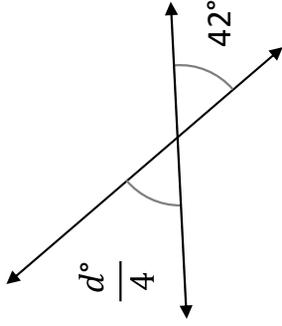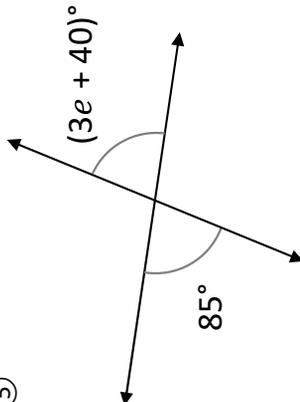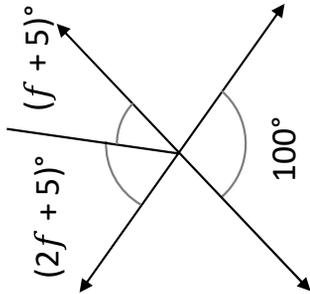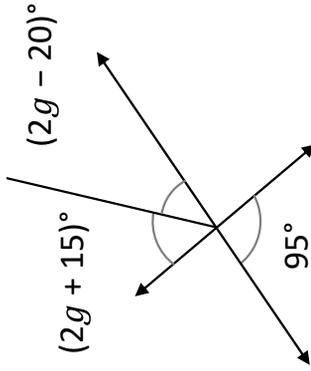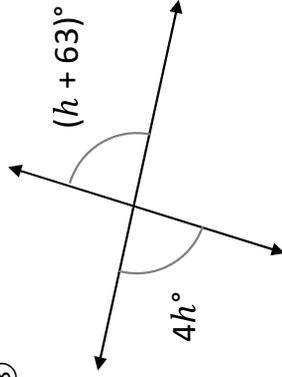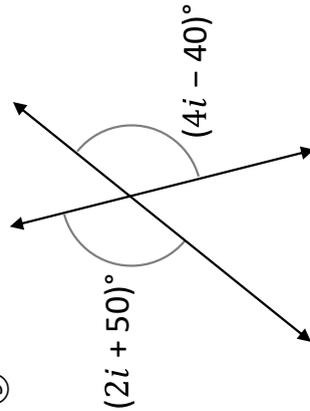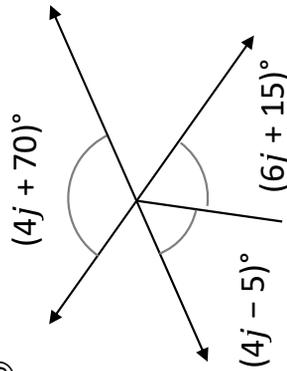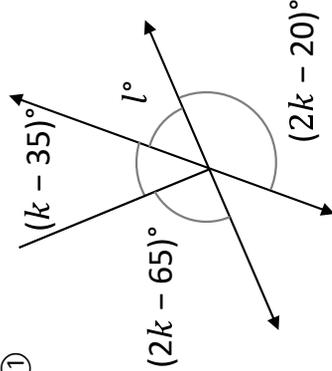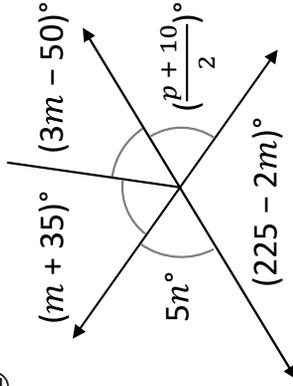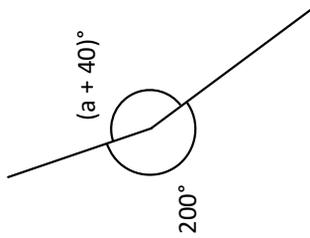
not drawn accurately

① $(a + 30)°$ $50°$

② $(b - 25)°$ $95°$

③ $3c°$ $66°$

④ $\dfrac{d°}{4}$ $42°$

⑤ $(3e + 40)°$ $85°$

⑥ $(2f + 5)°$ $(f + 5)°$ $100°$

⑦ $(2g + 15)°$ $(2g - 20)°$ $95°$

⑧ $4h°$ $(h + 63)°$

⑨ $(2i + 50)°$ $(4i - 40)°$

⑩ $(4j + 70)°$ $(4j - 5)°$ $(6j + 15)°$

⑪ $(k - 35)°$ $(2k - 65)°$ $l°$ $(2k - 20)°$

⑫ $(m + 35)°$ $(3m - 50)°$ $5n°$ $\left(\dfrac{p + 10}{2}\right)°$ $(225 - 2m)°$

12 Answers

25	15	45	20	80	22
120	10	168	40	30	21

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Fluency Practice

1)

$(a + 40)°$
$200°$

a = _____

2)

$(2b)°$
$(4b)°$

b = _____

3)

$c°$
$(c + 80)°$

c = _____

4)

$(d + 40)°$
$d°$
$(d + 5)°$

d = _____

5)

$(e - 5)°$
$(3e)°$
$(5e + 5)°$

e = _____

6)

$(2f + 15)°$
$(4f - 30)°$
$(4f + 25)°$

f = _____

7)

$g°$
$(0.5g)°$

g = _____

8)

$20°$
$40°$
$(2.5h + 20)°$

h = _____

9)

$(2i - 10)°$
$(3i - 10)°$

i = _____

10)

$(100 - 2j)°$
$(2j + 15)°$

j = _____

11)

$(3.5k + 20)°$
$(4k + 40)°$
$(60 - 2.5k)°$

k = _____

12)

$(3m + 24)°$
$(2n + 20)°$
$(80 - 4m)°$

n = _____
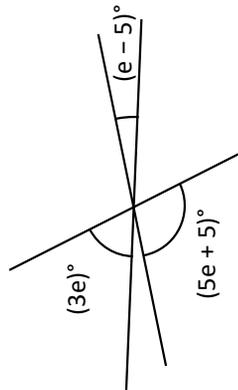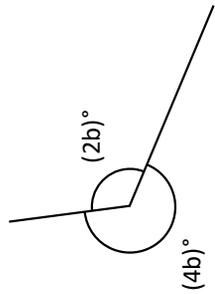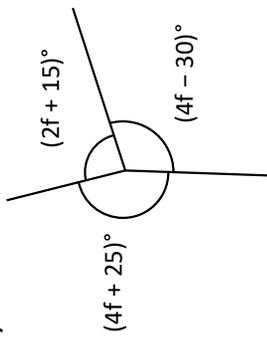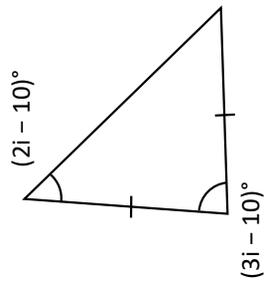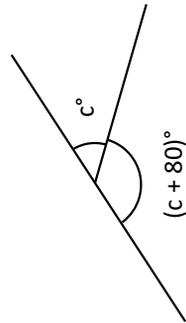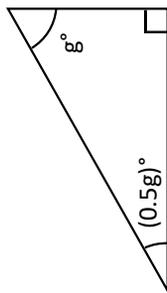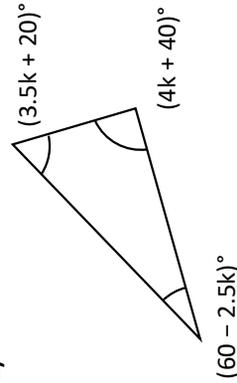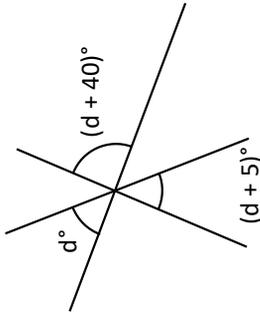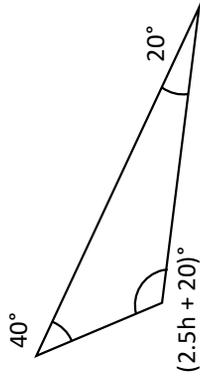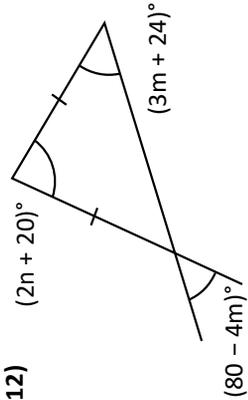
Fluency Practice

Using Algebra in Angles

(a) Find the value of x.
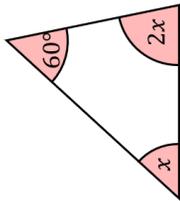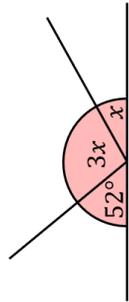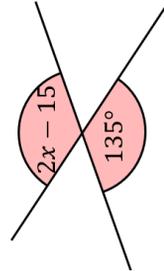
Triangle with angles $60°$, $2x$, and x.

(b) Find the value of x.

Angles $52°$, $3x$, x on a straight line.

(c) Find the value of x.

Angles $2x - 15$ and $135°$.

(d) Find the value of x.

Angles $6x$ and $72°$.

(e) Find the value of x.

Isosceles triangle with angles $2x$ and $x + 25$.

(f) Find the value of x.

Angles $x + 18$ and $5x - 77$.

(g) Find the value of x.

Angles $2x - 55$ and $x + 20$.
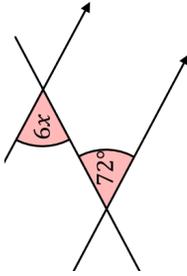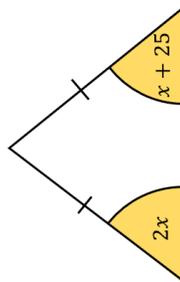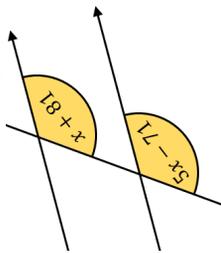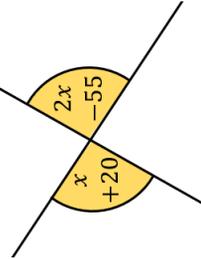
(h) Find the value of x.

Angles $3x$ and $130 - x$.
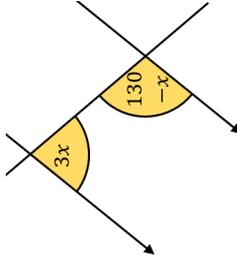
(i) The diagram shows a parallelogram. Find the value of x.

Parallelogram with angles $4x + 17$ and $179 - 2x$.

(j) Find the value of x.
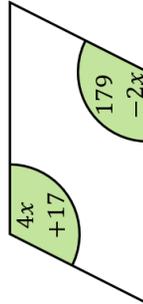
Quadrilateral with angles $3x - 12$, $5x$, $2x + 30$, $162 - x$.
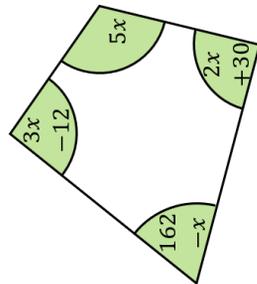
(k) Show that the lines AB and CD are parallel.

Angles $4x$, $8x - 12$ at point on line towards A and B; angles $164 - 3x$ at point towards C and D.
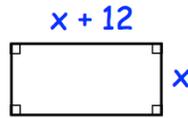
Page 102
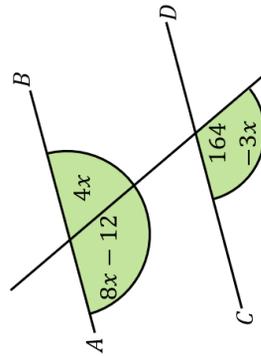
Question 1:   For each rectangle below, find x. Then use x to find the length and width of each. The expressions for lengths and widths are in centimetres.
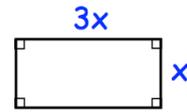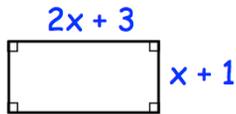
(a)   Perimeter = 24cm
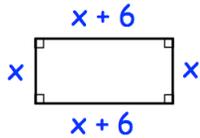
x + 6

x   x
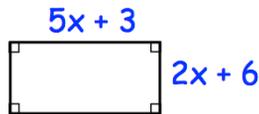
x + 6

(b)   Perimeter = 56cm

x + 12

x

(c)   Perimeter = 88cm

3x

x

(d)   Perimeter = 38cm

2x + 3

x + 1

(e)   Perimeter = 158cm

5x + 3

2x + 6

(f)   Perimeter = 60cm

x + 9

x - 3

(g)   Perimeter = 2m

2x - 9

x + 1

(h)   Perimeter = 82cm

6x + 1

10 - x

(i)   Perimeter = 40cm

3x + 4

2x - 1
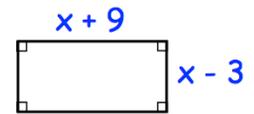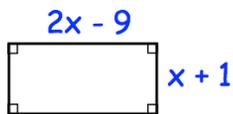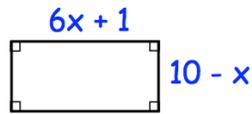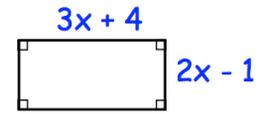
Question 2:   Each shape below is regular. For each, find x and the length of each side.

(a)   Perimeter = 27cm

x + 4

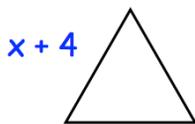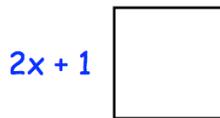(b)   Perimeter = 52cm

2x + 1

(c)   Perimeter = 93cm

3x - 2

(d)   Perimeter = 75cm

x + 7

(e)   Perimeter = 102cm

2x + 5

(f)   Perimeter = 64cm

25 - 2x

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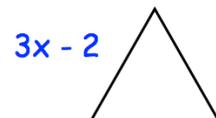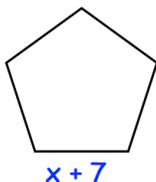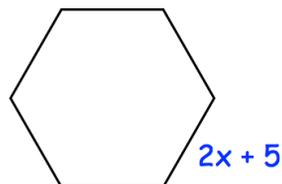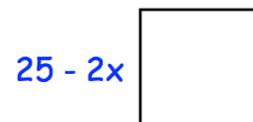
Question 3: For each shape below, find x.

(a)
Perimeter = 38cm
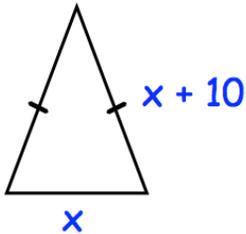
x + 10

x

(b)
Perimeter = 30cm

2x + 1

10 - x

(c)
Perimeter = 85.5cm

2x + 7

x + 9

(d)
Perimeter = 46cm

x - 2

x + 9

(e)
Perimeter = 24cm

5x + 5

x + 5

x + 7

(f)
Perimeter = 162cm

2x + 1

x   x

x   x

2x + 1
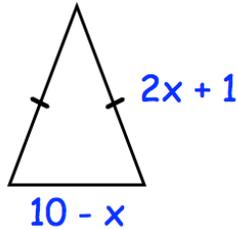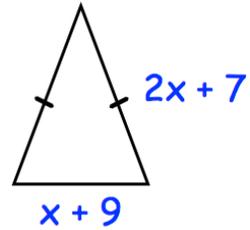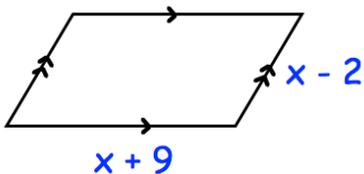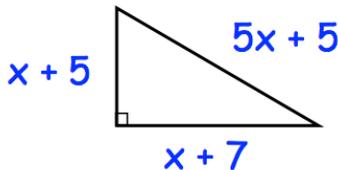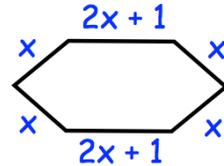
Question 4: Calculate x in each of these diagrams.

(a)

20°

x + 30°

(b)

x + 20

x

(c)

2x + 10

x + 20

(d)

3x + 10°

50° - x

(e)

2x + 25°   x - 10°

(f)

2x - 90°   x + 60°

(g)

3x + 10°   7x + 12°

(h)

3x + 110°   50° - x

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(i)

x - 10°
x + 20°

(j)

2x + 15°
x + 40°
2x + 20°

(k)

x - 15°
x - 20°
x - 5°
2x°
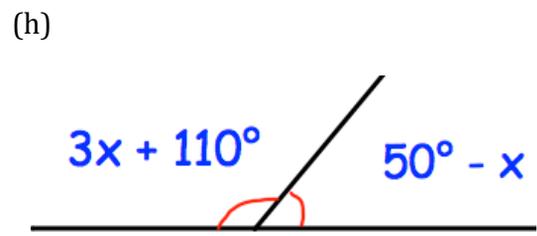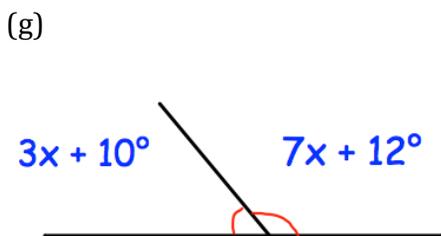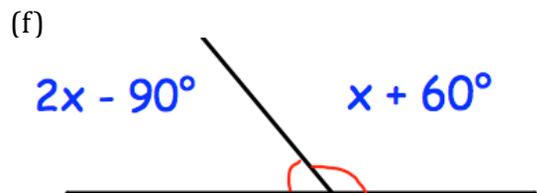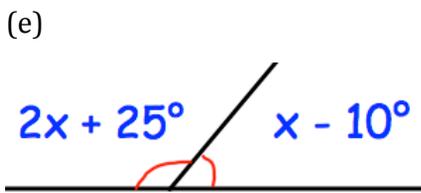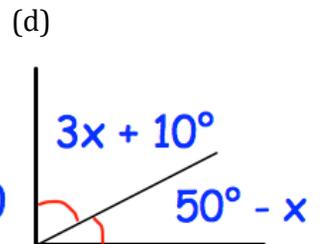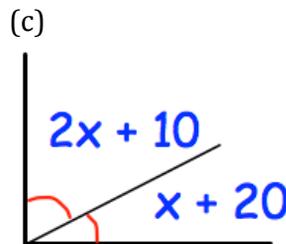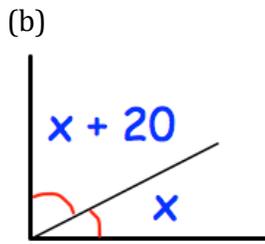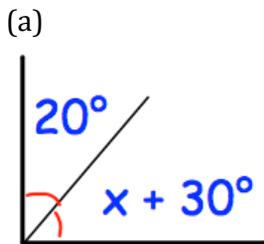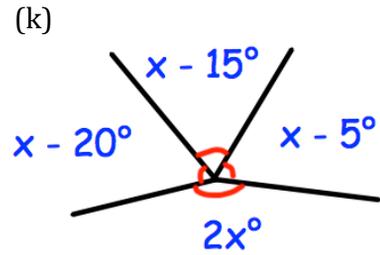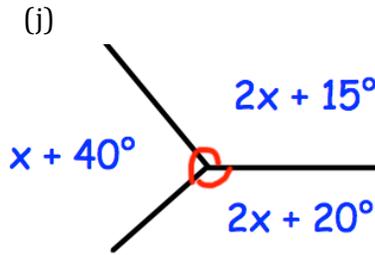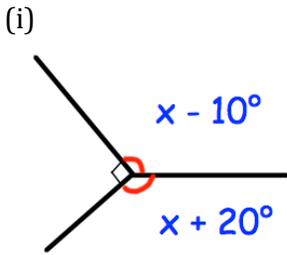
Question 5:   Calculate x in each of these diagrams.

(a)

x
x - 10

(b)

x
x + 15

(c)

2x
5x   3x

(d)

x + 14
2x - 10   x

(e)

x + 20
10x   x + 16
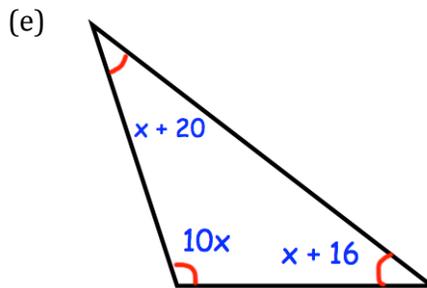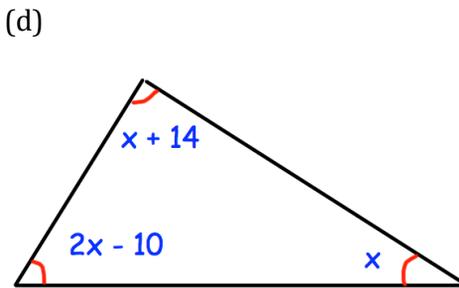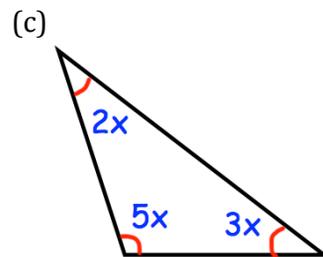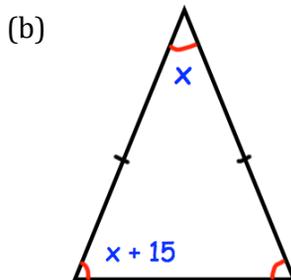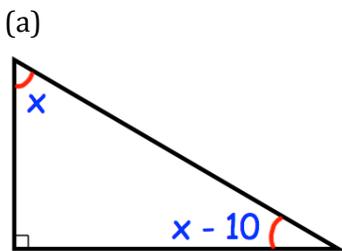
Question 6:   Calculate x in each of these diagrams.

(a)

2x + 5
x + 50
x - 5

(b)

2x + 10
x + 10
x - 16   2x + 20

(c)

x - 15
x - 10   x + 15
x + 20   x + 20

(d)

100°
x   x
x + 10   x + 10

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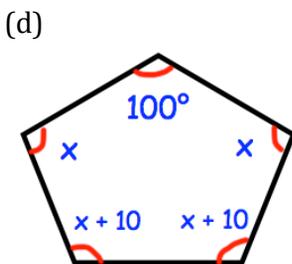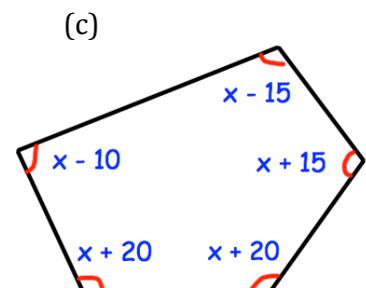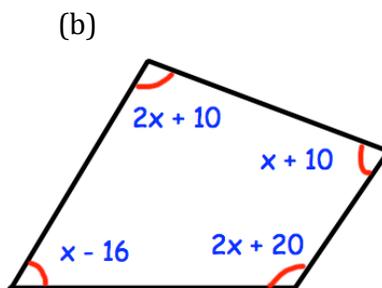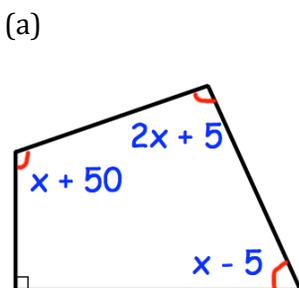
Apply

Question 1: A rectangle is 5cm longer than it is wide.
The perimeter of the rectangle is 86cm.
How long is the rectangle?

Question 2: A rectangle is 8cm longer than it is wide.
The perimeter of the rectangle is 72cm.
How wide is the rectangle?

Question 3: Each side of an isosceles triangle is 4cm longer than the base.
The perimeter of the triangle is 44cm.
How long is the base of the triangle?

Question 4: Three angles form a straight line.
The two smaller angles are equal.
The largest angle is three times larger than each of the smaller angles.
Work out the size of each of the three angles.

Question 5: Simon draws a right angled triangle.
One angle is 90°.
Of the other two angles, one is 22° larger than the other.
Work out the size of the smallest angle.

Question 6: Below both rectangles have the same perimeter.
Find the area of rectangle B.

15cm

6cm

Rectangle A

x

$4x + 1$
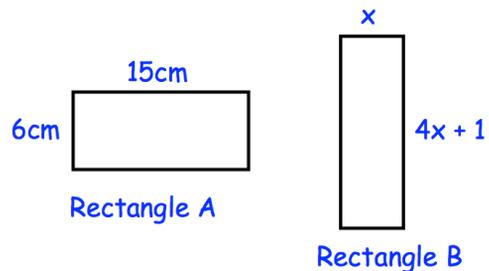
Rectangle B

Question 7: Find the perimeters of the rectangles below.
The expressions for the lengths and widths are in centimetres.

(a)
$4x + 1$
x x
$2x + 9$

(b)
$11x - 2$
$2x + 1$ $2x + 1$
$x + 18$

Answers

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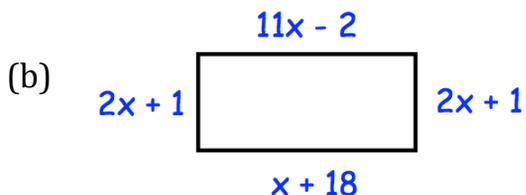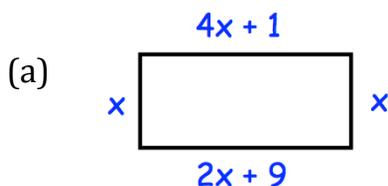
Fluency Practice

Using Algebra in Shapes

(a)

The perimeter of the square is 20 cm. Find the value of x.

$x - 1$

(b)

The perimeter of the rectangle is 20 cm. Find the value of x.

$x + 1$

$2x$
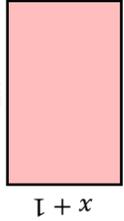
(c)

The perimeter of the triangle is 29 cm. Find the value of x.

$3x + 1$

$x + 4$

$2x$

(d)
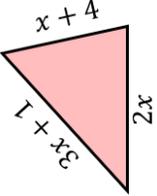
The perimeter of the rectangle is 34 cm. Find the value of x.

$x - 2$

$3x + 1$

(e)

The area of the rectangle is 36 cm^2. Find the value of x.

$2x - 1$

4

(f)

The area of the triangle is 50 cm^2. Find the value of x.

$4x - 6$

10
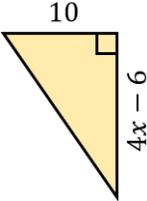
(g)

The perimeter of the rectangle is 28 cm. Find its area.

$x + 1$

$4x - 2$

(h)

The perimeter of the triangle is 24 cm. Find its area.

$3x - 5$

$x + 1$

$2x - 2$
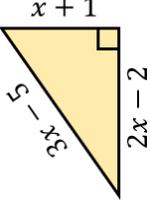
(i)

Find the perimeter of this rectangle.

$5x - 1$

$2x$

$x + 1$

(j)

Find the perimeter of this triangle.

$3x - 4$

$2x + 1$

$x + 2$
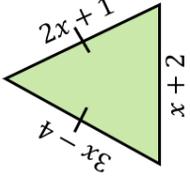
(k)

The perimeter of the triangle is equal to the perimeter of the rectangle. Find the value of x.

$4x - 1$

$2x - 3$

$2(x - 1)$

x

$2x + 1$
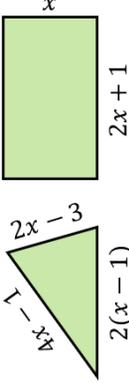
(l)

The area of the rectangle is twice the area of the triangle. Work out the value of x.

$3\ cm$

$2x + 1$

$4\ cm$

$x + 3$
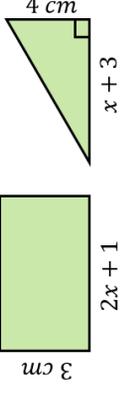
Fluency Practice

1.
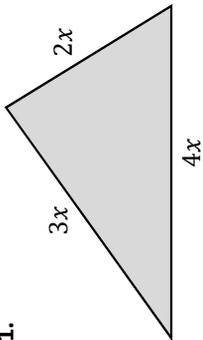
Write down an expression for the perimeter of this triangle.

The perimeter is 27 cm. Create an equation and then solve it to find the value of x.

$3x$

$2x$

$4x$

2.
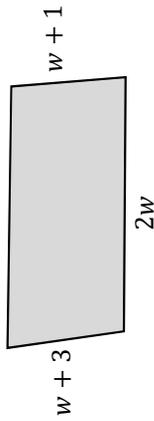
The perimeter of this quadrilateral is 31 cm.

Create an equation and solve it to find the value of w.

$w + 3$

$2w + 3$

$w + 1$

$2w$

3.
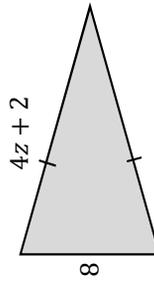
The perimeter of this isosceles triangle is 28 cm.

Create an equation and solve it to find the value of z.

$4z + 2$

8

4.
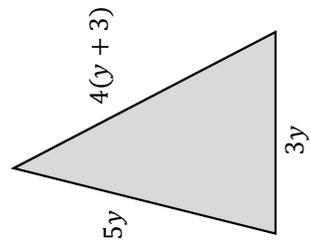
The perimeter of this triangle is 30 cm.

Create an equation and solve it to find the value of y.

$5y$

$4(y + 3)$

$3y$

5.
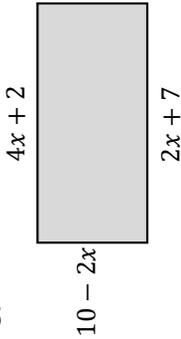
Form an equation using the two corresponding lengths of this rectangle.

Solve the equation to find the value of x. What is the perimeter of the rectangle?

$4x + 2$

$10 - 2x$

$2x + 7$

6.
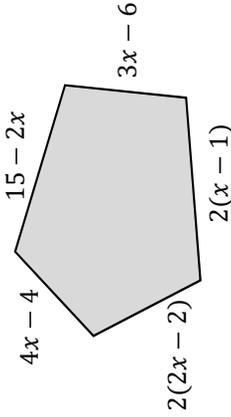
The perimeter of this irregular pentagon is 54 cm.

Find the value of x.

$15 - 2x$

$3x - 6$

$4x - 4$

$2(2x - 2)$

$2(x - 1)$

7.

A quadrilateral has interior angles:
$x + 120°, \quad x + 70°, \quad 2x + 30°, \quad 4x - 60°$

What is the value of x?

8.

The width of a rectangle is $x + 7$
The length of the rectangle is 3 times the width.
The perimeter of the rectangle is 72 cm.

What is the area of the rectangle?

9.

Rectangle **A** measures 6 cm by $(x + 1)$ cm.
Rectangle **B** measures 3 cm by $(3x + 7)$ cm.
Rectangle **B** has twice the area of Rectangle **A**.

Find the areas of **A** and **B**.

Fluency Practice

(a) Lily, Tia and Seher have a combined age of 53. Tia is twice as old as Lily. Seher is five years older than Lily. Form an equation and solve it to find Lily's age.

(b) Bruno is thinking of a number. If he triples the number, then subtracts seven the answer he gets is 35. Form an equation and solve it to find Bruno's number.

For each of the angle diagrams, form an equation and solve to find the value of x.

(a)

$2x$ $x - 15$ $3x$

(b)

$x + 30$ $4x$

(c)

$x + 15$ $2x$

(right margin diagrams)

$2x$ $x - 15$ $3x$

$x + 15$ $2x$
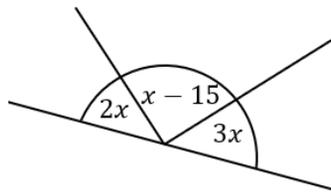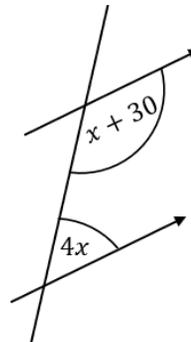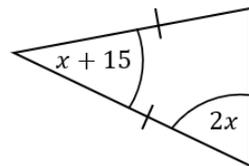
For each of the shapes given, form an equation from their perimeter or area and solve it to find x.

(a) $P = 31$ cm   (b) $A = 25.2$ cm^2

$2x + 3$ $x - 1$

14 cm

$3x$ cm

(c) $P = 78$ mm

$5x - 4$ $2x + 1$

(right margin diagrams)

$2x + 3$ $x - 1$

$5x - 4$ $2x + 1$
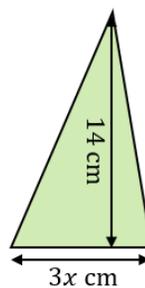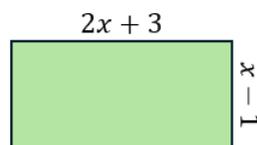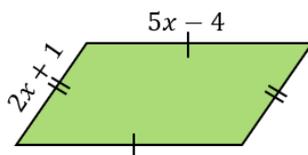
Purposeful Practice

15 pens put into pots : forming and solving equations

1.) I want each of three pots to hold one more than the one before

2.) I want each of three pots to hold two less than the one before

3.) I want each of three pots to hold three more than the one before

4.) I want each of three pots to hold four less than the one before

5.) I want each of three pots to hold five more than the one before

6.) Now I want two pots to have the same number of pens and the third one to have 3 times as many

7.) Now I want two pots to have the same number of pens and the third one to have half as many

8.) Now I want the second pot to have 2 more than double the amount in the first pot and the third pot to have 3 more than double the amount in the first pot

9.) For four pots, I want each pot to have twice as many as the one before it

10.) For five pots, I want each pot to have one more than the one before it

Purposeful Practice

(1)

if I put 4 pencils into each jar I will
have one jar left over
if I put 3 pencils into each jar I will
have one pencil left over
how many jars
how many pencils are there ?

(2)

if I put 5 pencils into each jar I will
have one jar left over
if I put 3 pencils into each jar I will
have one pencil left over
how many jars
how many pencils?

(3)

if I put 9 pencils into each jar I will
have two jars left over
if I put 6 pencils into each jar I will
have three pencils left over
how many jars
how many pencils?

(4)

if I put 10 pencils into each jar I
will have one jar left over
if I put 7 pencils into each jar I will
have two pencils left over
how many jars
how many pencils?

Purposeful Practice

what (same) number do you add to the numerator and denominator of:

(1) $\dfrac{2}{5}$ to make $\dfrac{5}{8}$?

(2) $\dfrac{4}{7}$ to make $\dfrac{2}{3}$?

(3) $\dfrac{3}{11}$ to make $\dfrac{5}{9}$?

(4) $\dfrac{2}{11}$ to make $\dfrac{2}{5}$?

(5) $\dfrac{3}{11}$ to make $\dfrac{3}{7}$?

(6) $\dfrac{1}{6}$ to make $\dfrac{1}{2}$?

(7) $\dfrac{1}{3}$ to make $\dfrac{3}{4}$?

(8) $\dfrac{5}{9}$ to make $\dfrac{9}{11}$?

(9) $\dfrac{5}{6}$ to make $\dfrac{2}{3}$?

(10) $\dfrac{2}{17}$ to make $\dfrac{2}{7}$?

(11) $\dfrac{3}{28}$ to make $\dfrac{2}{7}$?

(12) $\dfrac{2}{17}$ to make $\dfrac{3}{8}$?

(13) $\dfrac{4}{31}$ to make $\dfrac{1}{4}$?

(14) $\dfrac{3}{13}$ to make $\dfrac{3}{5}$?

(15) $\dfrac{1}{15}$ to make $\dfrac{2}{9}$?

(16) $\dfrac{2}{11}$ to make $\dfrac{5}{8}$?

(17) $\dfrac{2}{27}$ to make $\dfrac{1}{6}$?

(18) $\dfrac{2}{5}$ to make $\dfrac{11}{20}$?

Purposeful Practice

consecutive numbers – setting up and using an equations to solve a problem

| any number is **n**; the next number is **n + 1** |

find three consecutive numbers that add up to 45

find four consecutive numbers that add up to 38

find five consecutive numbers that add up to 60

| any even number is **2n**; the next even number is **2n + 2** etc |

find three consecutive even numbers that add up to 42

find four consecutive even numbers that add up to 60

find five consecutive even numbers that add up to 60

| any odd number is **2n + 1**; the next odd number is **2n + 3** etc |

find three consecutive odd numbers that add up to 57

find four consecutive odd numbers that add up to 48

find even numbers of consecutive odd numbers that add up to 72

| any multiple of 4 is **4n**; the next multiple of 4 is **4n + 4** etc |

find three consecutive multiples of 3 that add up to 63

find four consecutive multiples of 5 that add up to 150

find five consecutive multiples of 2 that add up to 94

Purposeful Practice

1) $0.2x + 5 = 8$

2) $0.2x - 0.5 = 8$

3) $0.5x + 0.2 = 8$

4) $0.8x - 0.2 = 50$

5) $0.2x + 0.15 = 0.5x$

6) $2x + 0.8 = 2 - 0.5x$

7) $0.002x + 50 = 80$

8) $80x + 0.002 = 0.05$

9) $0.2x - 0.07 = 0.35$

10) $0.03x + 0.04 = 0.46$

11) $9.7 - 0.07x = 1.3$

12) $3.3 + 0.03x = 0.07x + 0.5$

13) $0.2(x + 0.8) = 0.19$

14) $0.4(2x - 0.03) = 0.3$

15) $0.4(0.2x - 0.03) = 0.03$

16) $0.6(0.7x - 0.81) = 0.9$

17) $\frac{5x - 0.8}{0.2} = 3.5$

18) $\frac{0.9x - 0.04}{0.8} = 0.4$

19) $\frac{0.52x - 0.04}{0.8} = 0.4x$

20) $\frac{0.7x - 0.021}{0.3x} = 1.4$

21) $\frac{0.13}{0.004x} = 5.2$

22) $\frac{0.3}{1.4}(0.4x - 0.5) = 4.2$

23) $\frac{0.3}{1.4}(19.4x - 0.5) = 4.2x$

24) $0.541x + 0.81 = 0.416x + 1.56$

Purposeful Practice

a)

3 cm

a cm

7 cm

b)

6 cm

b cm

12 cm

Area = 27 cm²

$b = \boxed{}$ cm

c)

6 cm

c cm

20 cm

Area = 90 cm²

$c = \boxed{}$ cm

d)

d cm

8 cm

15 cm

Area = 160 cm²

$d = \boxed{}$ cm

e)

e cm

4.2 cm

5.5 cm

Area = 21 cm²

$e = \boxed{}$ cm

f)

f cm

8 cm
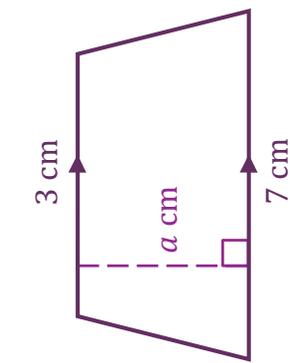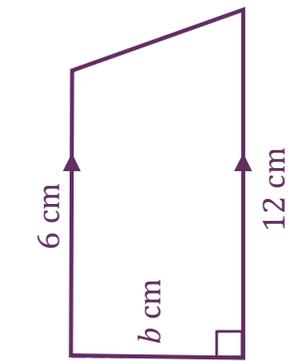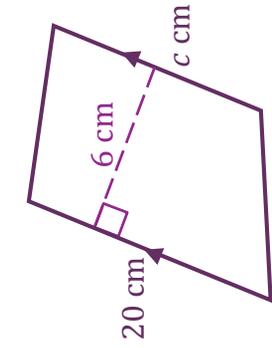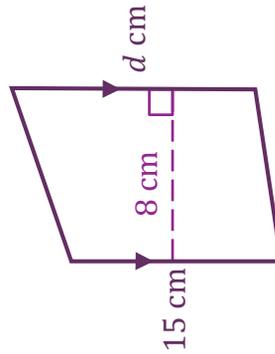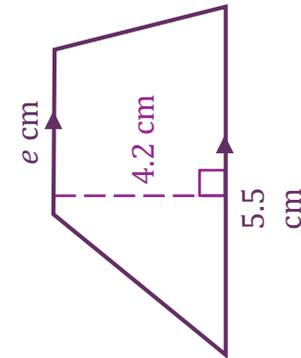
$f + 4$ cm
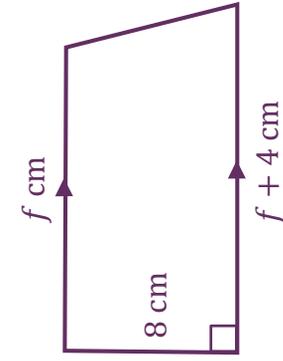
Area = 40 cm²

$f = \boxed{}$ cm

Purposeful Practice

g)

Area $= 28.5$ cm^2

Shape g) labels: $g + 2$ cm, 6 cm, $2g + 3$ cm

$g = \boxed{}$ cm

h)

Shape h) labels: $1\frac{1}{3}$ cm, h cm, $2\frac{1}{3}$ cm

Area $= 2\frac{1}{6}$ cm^2

$h = \boxed{}$ cm

i)

Shape i) labels: $1\frac{3}{5}$ cm, i cm, $1\frac{1}{4}$ cm

Area $= 2\frac{1}{4}$ cm^2

$i = \boxed{}$ cm

j)

Shape j) labels: $3\frac{3}{4}$ cm, $\frac{12}{13}$ cm, j cm

Area $= 2\frac{1}{2}$ cm^2

$j = \boxed{}$ cm

k)

Shape k) labels: $1\frac{1}{4}$ cm, $2\frac{1}{5}$ cm, k cm

Area $= 4\frac{1}{8}$ cm^2

$k = \boxed{}$ cm

l)

Shape l) labels: l cm, $\frac{5}{12}$ cm, $(l + 1\frac{1}{2})$ cm

Area $= \frac{5}{6}$ cm^2

$l = \boxed{}$ cm

Problem Solving

All numbers in the equation are between 3 and –3
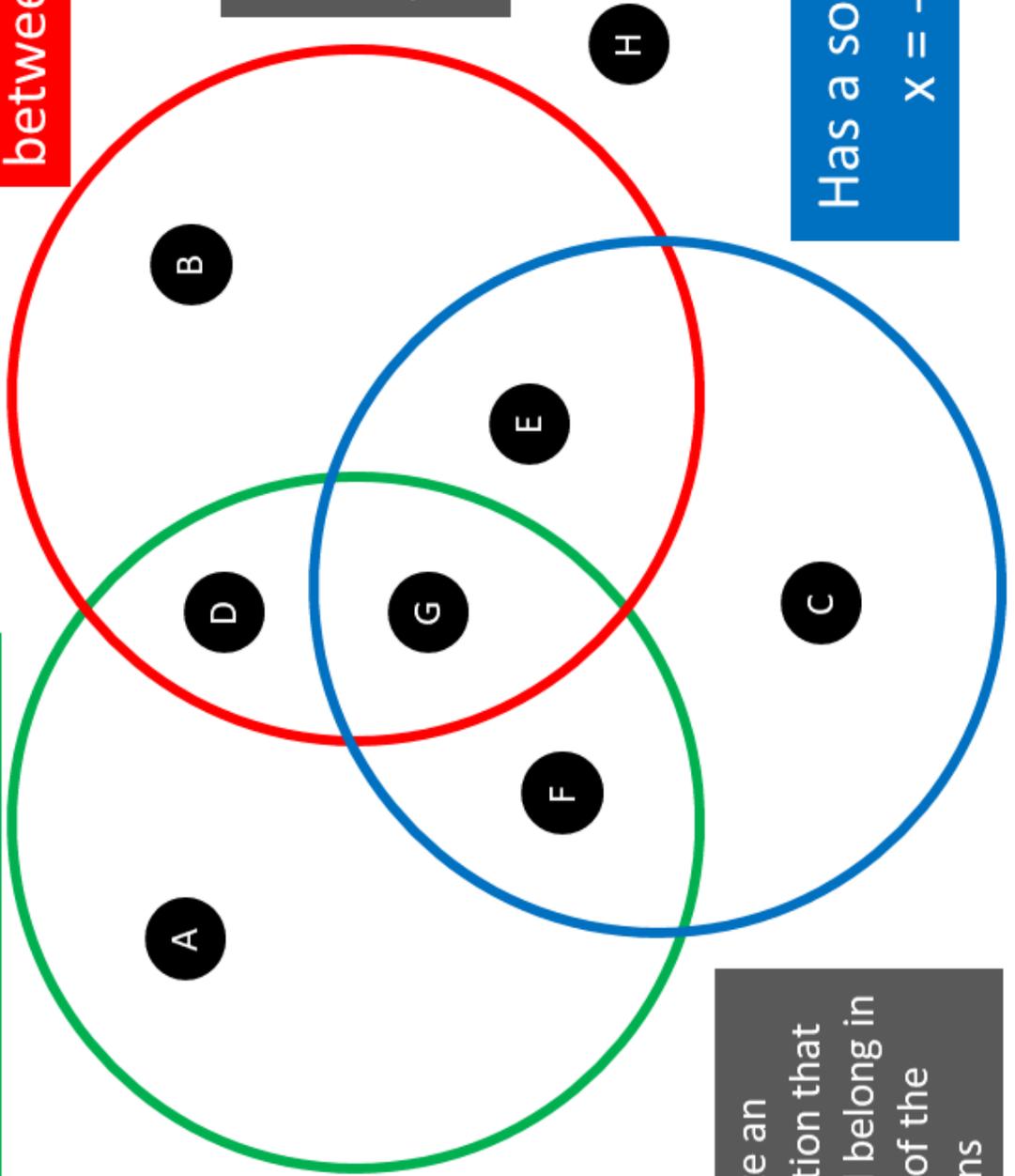
If you think a region is impossible to fill, convince me why!

Has a solution x = -9

Equation is of the form ...... = 3

Create an equation that could belong in each of the regions

A B C D E F G H

Problem Solving

Equation with a solution of $x = 3$
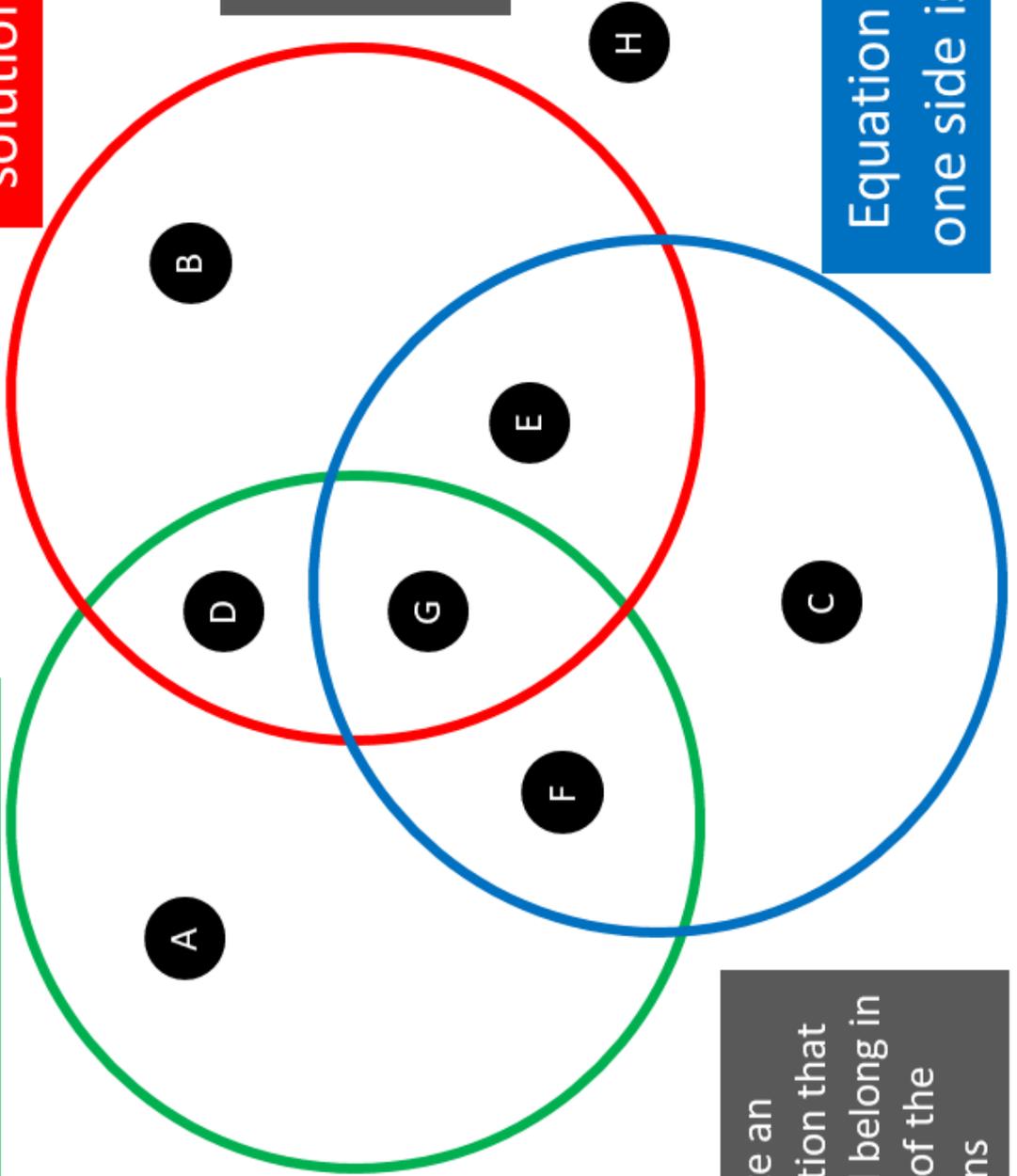
If you think a region is impossible to fill, convince me why!

Equation where one side is $3x + 4$

Equation with x-terms on both sides

Create an equation that could belong in each of the regions

A B C D E F G H

3 Sequences

Fluency Practice

Use the common difference to work out the next term:

1) $13, 20, 27, 34, \ldots$

2) $7, 11, 15, 19, \ldots$

3) $6, 11, 16, 21, \ldots$

4) $9, 17, 25, 33, \ldots$

5) $12, 16, 20, 24, \ldots$

6) $10, 16, 22, 28, \ldots$

7) $-4, 4, 12, 20, \ldots$

8) $8, 13, 18, 23, \ldots$

9) $27, 35, 43, 51, \ldots$

10) $7, 12, 17, 22, \ldots$

11) $8, 15, 22, 29, \ldots$

12) $5, 9, 13, 17, \ldots$

13) $24, 21, 18, 15, \ldots$

14) $72, 63, 54, 45, \ldots$

15) $12, 10, 8, 6, \ldots$

16) $24, 16, 8, 0, \ldots$

17) $-1, -3, -5, -7, \ldots$

18) $-49, -58, -67, -76, \ldots$

19) $-18, -21, -24, -27, \ldots$

20) $-8, -6, -4, -2, \ldots$

21) $-9.5, -15.5, -21.5, -27.5, \ldots$

22) $7.5, 17.5, 27.5, 37.5, \ldots$

23) $-15, -9.5, -4, 1.5, \ldots$

Intelligent Practice

1) What is the constant difference in the sequence?

a) The 7th term is 20 and the 10th term is 32

b) The 7th term is 20 and the 10th term is 35

c) The 7th term is 20 and the 10th term is 38

d) The 7th term is 20 and the 13th term is 38

e) The 7th term is 20 and the 13th term is 41

f) The 7th term is 20 and the 13th term is 44

g) The 7th term is 20 and the 14th term is 48

h) The 7th term is 20 and the 15th term is 52

i) The 7th term is 20 and the 23rd term is 52

j) The 7th term is 20 and the 31st term is 52

k) The 7th term is 20 and the 39th term is 52

l) The 7th term is 52 and the 39th term is 20

m) The 8th term is 52 and the 40th term is 20

n) The 8th term is 51 and the 40th term is 19

o) The 8th term is 60 and the 40th term is 12

2) Fill in the blanks so that the sequence increases by...

a) + 3
b) + 4
c) - 4
d) - 2
e) + $\frac{2}{3}$

15th term = ___20___   16th term = _____

15th term = ___20___   19th term = _____

15th term = ___20___   20th term = _____

20th term = ___20___   25th term = _____

15th term = ___20___   20th term = ___20___

15th term = ___20___   ___th term = ___80___

___th term = ___20___   20th term = ___80___

number patterns 1: fill in the gaps

these sequences all go up in equal sized steps

1) 2   5   __   __   14   __

2) __   13   22   __   __   __

3) __   17   21   __   __

4) 1   11   21   __   __

5) 10   19   __   __   __

4) 3   __   15   __   27

5) 5   __   17   __   23

6) __   __   34   40   __   52

7) 13   __   37   __   53

8) __   23   __   44   __

9) 39   __   __   75   __

10) __   35   __   __   __   67   __   4.2

11) __   35   __   __   __   __   20

12) __   2.4   __   3.4   __

13) 3.6   __   __   10.8   __

14) __   2.7   __   __   __

15) -3   __   __   13   __

16) -7   __   __   __   48   __

17) __   -2   __   __   13   __

18) 3.2   __   __   4.7   __

Fluency Practice

number patterns 2: fill in the gaps

these sequences all have a regular pattern

1) 2 5 7 — 19 —

2) 9 13 22 — 57 —

3) 2 5 10 17 — — —

4) — 3 8 11 — — —

5) 0 3 8 15 — — —

6) 3 6 12 24 — — —

7) 1 8 27 — — — —

8) 5 100 2000 — — —

9) 7 2 — 11 — 31 —

10) 360 180 90 — — —

11) 3 8 15 — — —

12) 3 4 11 — 29 —

13) 4 10 18 — — —

14) 2 18 32 — — —

15) 9 -6 3 — — —

16) 1.2 2.4 4.8 — — —

17) -3 0 5 — — —

18) -7 11 — 15 — —

19) 4.123 41.23 412.3 — — —

20) 3.2 1.6 0.8 — — —

Fluency Practice

Given that each of these sequences is arithmetic (linear), find the missing terms.

(a) $5, 8, \underline{\quad}, \underline{\quad}, 17, 20, \ldots$

(b) $9, \underline{\quad}, 17, 21, \underline{\quad}, 29, \ldots$

(c) $29, 27, \underline{\quad}, 23, \underline{\quad}\ 19, \ldots$

(d) $\underline{\quad}, -6, -11, \underline{\quad}, -21, -26, \ldots$

(e) $0.5, 0.8, \underline{\quad}, \underline{\quad}, 1.7, 2, \ldots$

Given that each of these sequences is geometric, find the missing terms.

(a) $1, 2, 4, \underline{\quad}, \underline{\quad}, 32, 64, \ldots$

(b) $8, 24, \underline{\quad}, 216, \underline{\quad}, 1944, \ldots$

(c) $\underline{\quad}, 100, 50, 25, \underline{\quad}, 6.25, \ldots$

(d) $8, \underline{\quad}, 18, 27, \underline{\quad}, 60.75, \ldots$

(e) $\underline{\quad}, \frac{1}{4}, \underline{\quad}, \frac{1}{16}, \frac{1}{32}, \frac{1}{64}, \ldots$

Given that each of these sequences is quadratic, find the missing terms.

(a) $5, 6, 8, \underline{\quad}, \underline{\quad}, 20, \ldots$

(b) $1, \underline{\quad}, \underline{\quad}, 13, 23, 36, \ldots$

(c) $\underline{\quad}, 4, 8, 14, \underline{\quad}, 32, \ldots$

(d) $12, \underline{\quad}, 20, 27, 36, \underline{\quad}, \ldots$

(e) $7, 8.5, 11, \underline{\quad}, \underline{\quad}, 24.5, \ldots$

Find the missing terms in each of these sequences.

(a) $1000, 200, \underline{\quad}, 8, 1.6, \underline{\quad}$

(b) $2, 3, 5, \underline{\quad}, \underline{\quad}, 17, \ldots$

(c) $\underline{\quad}, 2, -1, \underline{\quad}, -7, -10, \ldots$

(d) $\underline{\quad}, \underline{\quad}, 6.1, 6.5, 6.9, 7.3, \ldots$

(e) $\frac{3}{4}, \underline{\quad}, \frac{27}{16}, \frac{81}{32}, \frac{243}{64}, \underline{\quad}, \ldots$

Fluency Practice

State the rule, in words, for each sequence:

1) $13, 20, 27, 34, \ldots$

2) $7, 11, 15, 19, \ldots$

3) $6, 11, 16, 21, \ldots$

4) $9, 17, 25, 33, \ldots$

5) $12, 16, 20, 24, \ldots$

6) $10, 16, 22, 28, \ldots$

7) $-4, 4, 12, 20, \ldots$

8) $8, 13, 18, 23, \ldots$

9) $24, 21, 18, 15, \ldots$

10) $72, 63, 54, 45, \ldots$

11) $12, 10, 8, 6, \ldots$

12) $24, 16, 8, 0, \ldots$

13) $4, 8, 16, 32, \ldots$

14) $64, 32, 16, 8, \ldots$

15) $3, 12, 48, 192, \ldots$

16) $50, 10, 2, 0.4, \ldots$

17) $-1, -3, -5, -7, \ldots$

18) $-49, -58, -67, -76, \ldots$

19) $-18, -21, -24, -27, \ldots$

20) $-8, -6, -4, -2, \ldots$

21) $-9.5, -15.5, -21.5, -27.5, \ldots$

22) $7.5, 17.5, 27.5, 37.5, \ldots$

23) $-15, -9.5, -4, 1.5, \ldots$

Click here   Scan here
Fluency Practice

Question 1:   Describe the rule for each sequence below and find the next three terms

(a) 3, 5, 7, 9, . . .

(b) 5, 10, 15, 20, . . .

(c) 1, 4, 7, 10, . . .

(d) 20, 19, 18, 17, . . .

(e) 5, 10, 20, 40, . . .

(f) 10, 14, 18, 22, . . .

(g) 1, 6, 11, 16, . . .

(h) 2, 4, 8, 16, . . .

(i) 100, 80, 60, 40, . . .

(j) 5, 12, 19, 26, . . .

(k) 1, 10, 100, 1000, . . .

(l) 64, 32, 16, 8, . . .

(m) 55, 66, 77, 88, . . .

(n) 32, 41, 50, 59, . . .

(o) 15, 9, 3, − 3, . . .

(p) 2, 2.5, 3, 3.5, . . .

(q) 8, 22, 36, 50, . . .

(r) 1, 3, 9, 27, . . .

Question 2:   Describe the rule for each sequence below and find the next term.

(a) 2, 3, 5, 8, . . .

(b) 6, 8, 12, 18, . . .

(c) 5, 15, 35, 65, . . .

(d) 100, 99, 97, 94, . . .

(e) 3, 4, 7, 12, . . .

(f) 5, 6, 8, 12, . . .

Question 3:   Each sequence below increases/decreases by the same amount each time.
             Find the missing terms.

(a) 4, □, 8, 10, . . .

(b) 2, 5, □, 11, . . .

(c) 5, 9, □, 17, . . .

(d) 25, □, 37, 43, . . .

(e) 15, 24, □, 42, . . .

(f) 34, □, 24, 19, . . .

(g) 18, □, 40, 51, . . .

(h) 1, □, □, 19, . . .

(i) 3, □, □, 27, . . .

(j) 18, □, □, 39, . . .

(k) 6, □, □, □, 42, . . .

Corbett
mαths

Apply

Question 1:   Here are the first four terms of a number sequence 9, 15, 21, 27, . . .

(a) Write down the next term of the number sequence.
(b) Explain how you found your answer to (a)

James says that the 20th term of the sequence is 122

(c) Explain why James must be wrong.

Question 2:   Here are the first four terms of a number sequence 5, 8, 11, 14, . . .

(a) Write down the next term of the number sequence.
(b) Find the 10th term of the sequence.

The 100th term of the number sequence is 302

(c)   Work out the 101st term of the number sequence.
(d) Work out the 99th term of the number sequence.

Question 3:   Here are the first four terms of a number sequence 9, 13, 17, 21, . . .
Work out the difference between the 10th term and 15th term in the sequence.

Question 4:   Here are the first five terms of a number sequence   18, 30, 42, 54, 66, . . .

(a) Write down the next term of the number sequence

883 is **not** a term in this number sequence.

(b) Explain why.

Question 5:   The first term of a sequence is 3
The rule for continuing the sequence is **multiply by 4 then subtract 5**

(a) What is the second term of the sequence?
(b) What is the third term of the sequence?

Question 6:   The second term of a sequence is 26
The rule for continuing the sequence is **Add 7 then multiply by 2**

(a) What is the first term of the sequence?
(b) What is the third term of the sequence?

Question 7:   2, 6, 22, 86, . . .
The rule for continuing the sequence is **multiply by a then subtract b**

Find the values of **a** and **b**

Question 8:   Here are the first four terms of a number sequence $4, 9, 14, 19, \ldots$

Here are the first four terms of another number sequence $-11, -5, 1, 7, \ldots$

Find **three** numbers that are in both number sequences.

Question 9:   A number sequence is generated by increasing by the same amount each time. The first term is 7 and the fifth term is 13.

Work out the fourth term.

Question 10: Write down the next two terms in this sequence

$$5a - b, \ 9a - 2b, \ 13a - 3b, \ \ldots$$

Question 11: Find the next term in these sequences

(a) O, T, T, F, F, ...   (b) M, T, W, T, F, ...   (c) R, O, Y, G, B, ...

(d) 1, 11, 21, 1211, ...

Answers

Click here   Scan here

Fluency Practice

Determine whether the sequences are Linear, Geometric, Quadratic or Fibonacci-Type:

1) $2, 6, 18, 54, \ldots$

2) $2, 7, 14, 23, \ldots$

3) $3, 8, 11, 19, \ldots$

4) $4, 5, 12, 25, \ldots$

5) $9, 13, 17, 21, \ldots$

6) $88, 44, 22, 11, \ldots$

7) $29, 21, 13, 5, \ldots$

8) $2, 5, 14, 29, \ldots$

9) $-3, -6, -9, -12, \ldots$

10) $3, 10, 13, 23, \ldots$

Fluency Practice

Identify whether the following sequences are
arithmetic or **geometric**:

   (a)   1, 4, 16, 64, 256,…

   (b)   9, 4, -1, -6,…

   (c)   5, 25, 45, 65,…

   (d)   125, 100, 80, 64,…

   (e)   2727, 909, 303, 101,…

Identify whether the following sequences are
arithmetic, **geometric**, or **quadratic**:

(a) 8, 13, 20, 29, 40,…	(f) 3, 8, 17, 30, 47,…
(b) 5, 20, 45, 80, 125…	(g) 1, 1.1, 1.21, 1.331,…
(c) 2, 6, 18, 54,…	(h) 16, 24, 36, 54,…
(d) 4, 10, 22, 40, 64…	(i) 200, 180, 162, 145.8,…
(e) 1280, 320, 80, 20,…	(j) 343, 490, 700, 1000,…

Identify whether the following are **arithmetic**, **geometric**,
or **quadratic**, and find the next term in each sequence.

   (a)   0, 7, 18, 33, 52, 75,…

   (b) $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16},$…

   (c)   3, -6, 12, -24, 48,…

   (e)   -1.4, -2.2, -3, -3.8,…

Purposeful Practice

Find the next 3 terms in each sequence. Is it an arithmetic, geometric or quadratic sequence?

								Type of Sequence
7	15	23	31	39				
3	5	9	15	23				
10	7	4	1	-2				
1	2	4	8	16				
4	9	17	28	42				
96	48	24	12	6				
2.4	2.6	2.8	3	3.2				
-8	-2	4	10	16				
90	87	80	69	54				
-0.5	-1	-2	-4	-8				
9	12	18	27	39				
0.02	0.2	2	20	200				
-4	-11	-18	-25	-32				
0.35	0.7	1.4	2.8	5.6				
10	14	19	25	32				
3	-9	27	-81	243				
$\frac{2}{3}$	$\frac{7}{6}$	$\frac{5}{3}$	$\frac{13}{6}$	$\frac{8}{3}$				
$\frac{4}{5}$	$\frac{4}{15}$	$\frac{4}{45}$	$\frac{4}{135}$	$\frac{4}{405}$				

Fluency Practice

Q	State the type of sequence and the next term	Answers
1	$5, 7, 9, 11, 13, \dots$	
2	$4, 7, 12, 19, 28, \dots$	
3	$3, 6, 12, 24, 48, \dots$	
4	$3, 6, 9, 15, 24, \dots$	
5	$1, 4, 7, 10, 13, \dots$	
6	$1, 10, 25, 46, 73, \dots$	
7	$2, 6, 18, 54, 162, \dots$	
8	$2, 6, 8, 14, 22, \dots$	
9	$1, -4, -9, -14, -19, \dots$	
10	$1, -4, -13, -26, -43, \dots$	
11	$1, -4, 16, -64, 256, \dots$	
12	$1, -4, 3, -1, 2, \dots$	
13	$a + b, a + 2b, a + 3b, a + 4b, a + 5b, \dots$	
14	$a + b + c, 4a + 2b + c, 9a + 3b + c, 16a + 4b + c, 25a + 5b + c, \dots$	
15	$a, ab, ab^2, ab^3, ab^4, \dots$	
16	$a, b, a + b, a + 2b, 2a + 3b, \dots$	

Fluency Practice

Each of these sequences is arithmetic (linear). Find the next three terms.
(a) $11, 13, 15, 17, \ldots$
(b) $6, 11, 16, 21, \ldots$
(c) $4.6, 4.9, 5.2, 5.5, \ldots$
(d) $23, 19, 15, 11, \ldots$
(e) $9, 8.5, 8, 7.5, \ldots$
(f) $-3, -9, -15, -21, \ldots$

Each of these sequences is geometric. Find the next three terms.
(a) $2, 4, 8, 16, \ldots$
(b) $6, 18, 54, 162, \ldots$
(c) $10, 50, 250, 1250, \ldots$
(d) $160, 80, 40, 20, \ldots$

Each of these sequence is quadratic. Find the next three terms.
(a) $3, 4, 6, 9, \ldots$
(b) $6, 8, 12, 18, \ldots$
(c) $1, 7, 14, 22, \ldots$
(d) $100, 97, 92, 85, \ldots$

For each of these sequences:
(i)   decide whether they are arithmetic (linear), geometric or quadratic
(ii)   find the next two terms
(a) $3, 6, 12, 24, \ldots$
(b) $7, 14, 21, 28, \ldots$
(c) $10, 7, 4, 1, \ldots$
(d) $8, 9, 11, 14, \ldots$
(e) $2, 5, 12.5, 31.25, \ldots$
(f) $5, 7, 11, 17, \ldots$

A sequence starts $2, 4, \ldots$ Write down the next three terms in the sequence if it is (i) arithmetic, (ii) geometric and (iii) quadratic.

Purposeful Practice

Continuing Sequences

What is the rule to find the next term in each of these types of sequences?

An **arithmetic** progression: 6, 11, 16, 21, 26…

A **geometric** progression: 1, 3, 9, 27, 81…

A **quadratic** progression: 6, 8, 12, 18, 26…

The first terms of a sequence have been given.
Continue the sequence as if it was
an arithmetic, geometric or quadratic progression.

a

	1st	2nd	3rd	4th	5th	6th
Arithmetic	1			10		
Geometric		4			256	
Quadratic			8			26

b

	1st	2nd	3rd	4th	5th	6th
Arithmetic	2				18	
Geometric		6			162	
Quadratic			12		30	

c

	1st	2nd	3rd	4th	5th	6th
Arithmetic	3					18
Geometric		6			48	
Quadratic			12			48

d

	1st	2nd	3rd	4th	5th	6th
Arithmetic	120					
Geometric		60				
Quadratic			-2			

e

	1st	2nd	3rd	4th	5th	6th
A	8					
G		-4				
Q			-20			

f

	1st	2nd	3rd	4th	5th	6th
A	20					
G		30				
Q			35			

g

	1st	2nd	3rd	4th	5th	6th
A	100					
G		80				
Q			68			

Complete your own sequences here:

	1st	2nd	3rd	4th	5th	6th
Arith.						
Geo.						
Quad.						

FILL THE GAPS

Determine the missing numbers in each sequence.
The type of sequence is written next to it.

Arithmetic

	8			29		…

Geometric

	6	54				…

Fibonacci

		9		37	…

Quadratic

4	7	12				…

???????

	10		21		36	…

Fluency Practice

Put the following sequences in the correct column:
- $2, 4, 6, 8, \ldots$

- $-3, -10, -17, -24, \ldots$

- $31, 32, 33, 34, \ldots$

- $1, 4, 9, 16, \ldots$

- $8, 16, 24, 32, \ldots$

- $100, 80, 70, 65, \ldots$

- $7, -7, 7, -7, \ldots$

- $7, 15, 23, 31, \ldots$

- $2, 5, 9, 14, \ldots$

- $a, a + 3, a + 6, a + 9, \ldots$

- $7, 2.5, -2, -6.5, \ldots$

Linear Sequences	Not Linear Sequences

Purposeful Practice

$14, 22, 30, 38, \ldots$

$0.7, 1.1, 1.5, 1.9, \ldots$

$207, 211, 215, 219 \ldots$

$-1, 3, 7, 11, \ldots$

$7, 11, 15, 19, \ldots$

$19, 15, 11, 7, \ldots$

$4, 8, 12, 16, \ldots$

$-7, -11, -15, -19, \ldots$

$6, 10, 14, 18 \ldots$

$7, 10, 13, 15, \ldots$

$7, 3, -1, -5, \ldots$

$4n - 3$
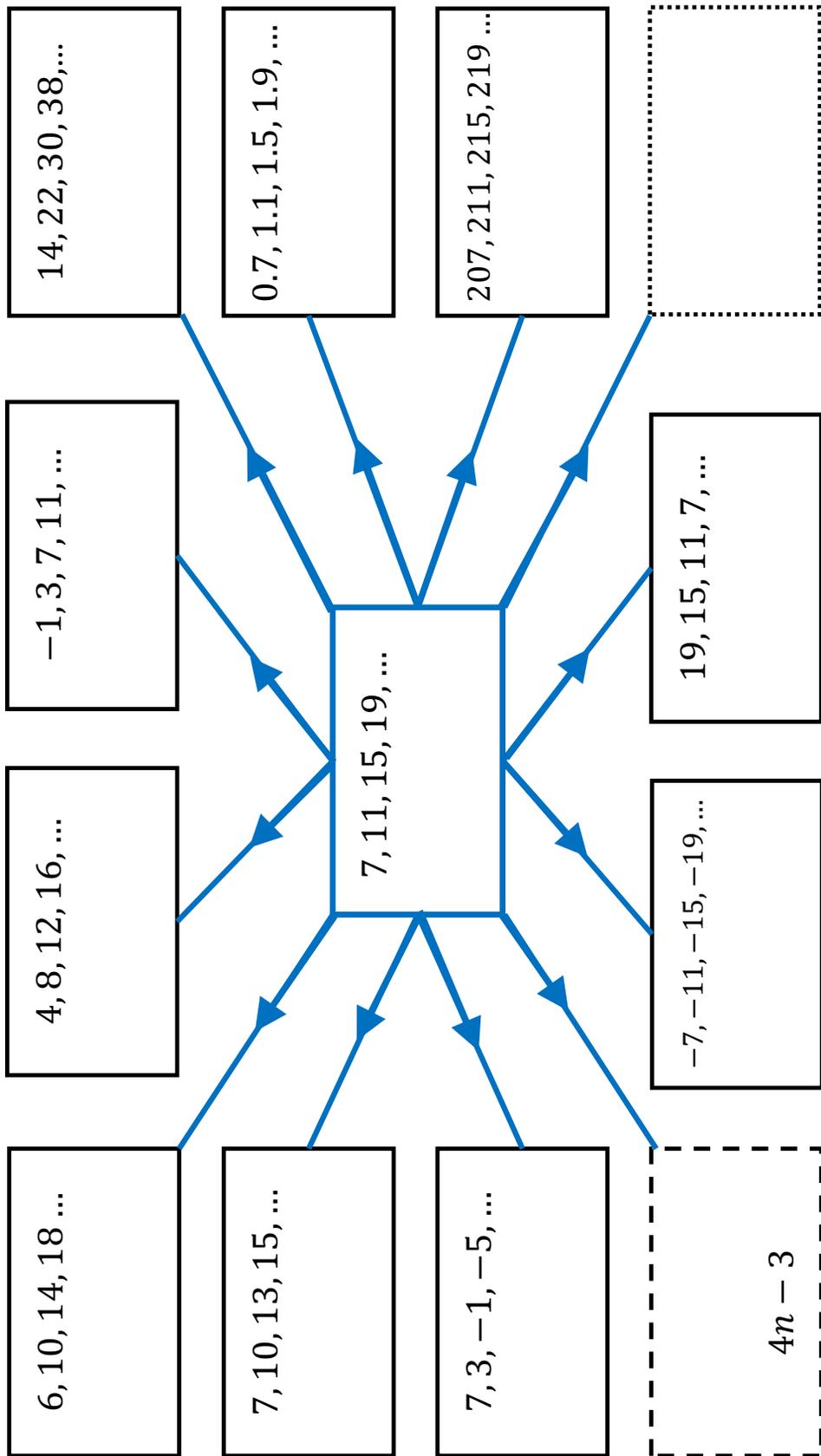
Purposeful Practice

Instructions: Write a new sequence based on the nth term of the given sequences. Complete the remaining boxes by making the minimum change possible to the nth term of the original sequence.

Coefficient of *n* in *n*th term

Constant value in *n*th term		Less	Same	More
	More			
	Same		4, 7, 10, 13, 16, ...	
	Less			

Fluency Practice

Find the nth term of the following sequences:

1) $\frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}, \ldots$

2) $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, \ldots$

3) $\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \ldots$

4) $\frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}, \ldots$

5) $\frac{1}{2}, \frac{3}{4}, 1, 1\frac{1}{4}, \ldots$

6) $\frac{3}{5}, \frac{4}{5}, 1, 1\frac{1}{5}, \ldots$

7) $\frac{1}{2}, \frac{2}{3}, \frac{5}{6}, 1, \ldots$

8) $1, 1\frac{2}{3}, 2\frac{1}{3}, 3, \ldots$

9) $\frac{5}{6}, 1, 1\frac{1}{6}, 1\frac{1}{3}, \ldots$

10) $1\frac{1}{2}, 1\frac{5}{8}, 1\frac{3}{4}, 1\frac{7}{8}, \ldots$

11) $\frac{4}{7}, \frac{6}{7}, 1\frac{1}{7}, 1\frac{3}{7}, \ldots$

12) $3\frac{1}{3}, 2\frac{2}{3}, 2, 1\frac{1}{3}, \ldots$

Intelligent Practice

A: Positive integers

	Sequence	nth term rule
A1.	$5, 8, 11, 14, 17 \ldots$	
A2.	$4, 7, 10, 13, 16 \ldots$	
A3.	$2, 5, 9, 11, 15 \ldots$	
A4.	$2, 6, 10, 14, 18 \ldots$	
A5.	$2, 7, 12, 17, 22 \ldots$	
A6.	$4, 14, 24, 34, 44 \ldots$	
A7.	$-6, 4, 14, 24, 34 \ldots$	

B: Including negatives

	Sequence	nth term rule
B1.	$1, 3, 5, 7, 9 \ldots$	
B2.	$-1, -3, -5, -7, -9 \ldots$	
B3.	$-2, -4, -6, -8, -10 \ldots$	
B4.	$10, 8, 6, 4, 2 \ldots$	
B5.	$-10, -8, -6, -4, -2 \ldots$	
B6.	$-5, -4, -3, -2, -1 \ldots$	
B7.	$1, 2, 3, 4, 5$	

C: Including decimals

	Sequence	nth term rule
C1.	$5, 11, 17, 23, 29 \ldots$	
C2.	$2.5, 5.5, 8.5, 11.5, 14.5 \ldots$	
C3.	$4.5, 7.5, 10.5, 13.5, 16.5 \ldots$	
C4.	$0.9, 1.5, 2.1, 2.7, 3.3 \ldots$	
C5.	$-0.1, 0.5, 1.1, 1.7, 2.3 \ldots$	
C6.	$2.3, 1.7, 1.1, 0.5, -0.1$	
C7.	$2.3, 1.6, 0.9, 0.2, -0.5 \ldots$	

D: Including fractions

	Sequence	nth term rule
D1.	$13, 14, 15, 16, 17 \ldots$	
D2.	$3\frac{1}{4}, 3\frac{1}{2}, 3\frac{3}{4}, 4, 4\frac{1}{4}, \ldots$	
D3.	$3, 3\frac{1}{4}, 3\frac{1}{2}, 3\frac{3}{4}, 4, \ldots$	
D4.	$9, 9\frac{3}{4}, 10\frac{1}{2}, 11\frac{1}{4}, 12, \ldots$	
D5.	$12, 11\frac{1}{4}, 10\frac{1}{2}, 9\frac{3}{4}, 9, \ldots$	
D6.	$12, 11\frac{1}{5}, 10\frac{2}{5}, 9\frac{3}{5}, 8\frac{4}{5}, \ldots$	
D7.	$12\frac{1}{3}, 11\frac{8}{15}, 10\frac{11}{15}, 9\frac{14}{15}, 9\frac{2}{15}, \ldots$	

Fluency Practice

Find the nth term for each of these sequences.

(a) $4, 8, 12, 16, 20, \dots$

(b) $7, 14, 21, 28, 35, \dots$

(c) $5, 10, 15, 20, 25, \dots$

(d) $11, 22, 33, 44, 55, \dots$

Find the nth term for each of these sequences.

(a) $6, 11, 16, 21, 26, \dots$

(b) $7, 9, 11, 13, 15, \dots$

(c) $13, 16, 19, 22, 25, \dots$

(d) $9, 15, 21, 27, 33, \dots$

(e) $4, 5, 6, 7, 8, \dots$

(f) $6, 10, 14, 18, 22, \dots$

Find the nth term for each of these sequences.

(a) $2, 5, 8, 11, 14, \dots$

(b) $1, 5, 9, 13, 17, \dots$

(c) $3, 8, 13, 18, 23, \dots$

(d) $4, 14, 24, 34, 44, \dots$

(e) $0, 2, 4, 6, 8, \dots$

(f) $-2, 5, 12, 19, 26, \dots$

Find the nth term of each of these sequences.

(a) $4.4, 4.6, 4.8, 5, 5.2, \dots$

(b) $1.5, 3.5, 5.5, 7.5, 9.5, \dots$

(c) $-13, -11, -9, -7, -5, \dots$

(d) $-4, -3.5, -3, -2.5, -2, \dots$

Find the nth term of these sequences.

(a) $a + 2, a + 4, a + 6, a + 8, \dots$

(b) $a + b, a + 2b, a + 3b, a + 4b, \dots$

(c) $c, c + 5, c + 10, c + 15, \dots$

Fluency Practice

Find the nth term for each of these sequences.

(a) $-5, -10, -15, -20, -25, \ldots$

(b) $-2, -4, -6, -8, -10, \ldots$

(c) $-8, -16, -24, -32, -40, \ldots$

(d) $-1, -2, -3, -4, -5, \ldots$

Find the nth term for each of these sequences.

(a) $9, 7, 5, 3, 1, \ldots$

(b) $17, 14, 11, 8, 5, \ldots$

(c) $45, 40, 35, 30, 25, \ldots$

(d) $16, 15, 14, 13, 12, \ldots$

(e) $26, 20, 14, 8, 2, \ldots$

(f) $82, 72, 62, 52, 42, \ldots$

Find the nth term for each of these sequences.

(a) $6, 1, -4, -9, -14, \ldots$

(b) $5, 2, -1, -4, -7, \ldots$

(c) $3, 1, -1, -3, -5, \ldots$

(d) $8, -2, -12, -22, -32, \ldots$

(e) $-3, -5, -7, -9, -11, \ldots$

(f) $-5, -8, -11, -14, -17, \ldots$

Find the nth term of each of these sequences.

(a) $8, 7.6, 7.2, 6.8, 6.4, \ldots$

(b) $6.5, 5.5, 4.5, 3.5, 2.5, \ldots$

(c) $2.8, 1.7, 0.6, -0.5, -1.6, \ldots$

(d) $-3.8, -4.7, -5.6, -6.5, -7.4, \ldots$

Find the nth term of these sequences.

(a) $a + 5, a + 3, a + 1, a - 1, \ldots$

(b) $b - c, b - 2c, b - 3c, \ldots$

(c) $d, d - 3, d - 6, d - 9, \ldots$

Fluency Practice

Q	Find the nth term of the sequence	Answers
1	$1, 4, 7, 10, 13, \ldots$	
2	$-1, -4, -7, -10, -13, \ldots$	
3	$-1, 1, 3, 5, 7, \ldots$	
4	$-5, -7, -9, -11, -13, \ldots$	
5	$12, 19, 26, 33, 40, \ldots$	
6	$-2, -9, -16, -23, -30, \ldots$	
7	$2, 9, 16, 23, 30, \ldots$	
8	$-12, -19, -26, -33, -40, \ldots$	
9	$-10.5, -10, -9.5, -9, -8.5, \ldots$	
10	$10.5, 10, 9.5, 9, 8.5, \ldots$	
11	$a + b, 2a + b, 3a + b, 4a + b, 5a + b, \ldots$	
12	$b - a, b - 2a, b - 3a, b - 4a, b - 5a, \ldots$	

Fluency Practice

Linear Sequences

Find the nth term of the sequence 11, 6, 1, −4, …

11, 6, 1, −4, …
The difference between terms is −5
The shift from the −5 × table is +16
The nth term is −5n + 16

Find the nth term of the sequence 8, 6, 4, 2, …

Find the nth term of the sequence 8, 0, −8, −16

Find the nth term of the sequence 1.3, 1.1, 0.9, 0.7, …

Find the nth term of the sequence 1, 4, 7, 10, …

1, 4, 7, 10, …
The difference between terms is +3
The shift from the 3 × table is −2
The nth term is 3n − 2

Find the nth term of the sequence 6, 10, 14, 18, …

Find the nth term of the sequence −1, 5, 11, 16, …

Find the nth term of the sequence 8.1, 8.5, 8.9, 9.3, …

Find the missing term in the sequence 5, ___, 11, 14, …

The term-to-term rule is add 3:
5 + 3 = 8
The sequence is
5, **8**, 11, 14, …

Find the missing term in the sequence 7, 13, ___, 25, …

Find the missing term in the sequence −23, ___, −17, −14, …

Find the missing term in the sequence 5, 4.4, ___, 3.2, …

Find the next three terms in the sequence 8, 12, 16, …

The term-to-term rule is add 4:
16 + 4 = **20**
20 + 4 = **24**
24 + 4 = **28**

Find the next three terms in the sequence 11, 8, 5, …

Find the next three terms in the sequence 3, 5.5, 8, …

Find the next three terms in the sequence −3, −7, −11, …

For each linear sequence, write down the first five terms and the nth term rule.

A	An increasing linear sequence with a first term of 6	
B	An increasing linear sequence with a second term of 7	
C	A linear sequence that is based on the 5 times table	
D	A linear sequence where the difference between terms is 3	
E	A decreasing linear sequence with a first term of 12	
F	A decreasing linear sequence where the difference between terms is 7	
G	A linear sequence with only positive terms	
H	An increasing linear sequence that has the terms 3 and 15	
I	A linear sequence with only negative terms	
J	An increasing linear sequence that has decimal terms	
K	A linear sequence where all terms are even numbers	
L	A linear sequence where all the terms end in a 3	
M	An increasing linear sequence where alternate terms are odd	
N	An increasing linear sequence where the 3rd term is twice the 1st term	
O	A decreasing linear sequence where the 5th term is half of the 2nd term	

Question 1: Find the nth term for each of the following sequences

(a)   5, 8, 11, 14, ...

(b)   9, 14, 19, 24, ...

(c)   1, 3, 5, 7, ...

(d)   10, 14, 18, 22, ...

(e)   2, 7, 12, 17, ...

(f)   3, 9, 15, 21, ...

(g)   11, 31, 51, 71, ...

(h)   20, 23, 26, 29, ...

(i)   1, 7, 13, 19, ...

(j)   100, 125, 150, 175, ...

(k)   13, 22, 31, 40, ...

(l)   1.5, 2, 2.5, 3, ...

Question 2: Find the nth term for each of the following sequences

(a)   10, 7, 4, 1, ...

(b)   6, 4, 2, 0, ...

(c)   9, 4, -1, -6, ...

(d)   20, 10, 0, -10, ...

(e)   5, -1, -7, -13, ...

(f)   5, 4, 3, 2, ...

(g)   -6, -13, -20, -27, ...

(h)   -10, -13, -16, -19, ...

(i)   2.5, 2, 1.5, 1, ...

Question 3: Find the 100th term for each sequence in Questions 1 and 2.

Question 4: The nth term for some sequences are given below.
        Find the first 5 terms for each sequence.

(a)   5n + 3

(b)   2n + 9

(c)   3n – 2

(d)   10n – 6

(e)   9n + 10

(f)   n + 8

(g)   −7n + 20

(h)   50 – 5n

(i)   3.5n + 4

Question 5:

(a) Is 205 a term in the sequence 1, 5, 9, 13, ... ?
(b) Is 200 a term in the sequence 4, 10, 16, 22, ... ?
(c) Is 1000 a term in the sequence 50, 65, 80, 95, ... ?
(d) Is 999 a term in the sequence 11, 20, 29, 38, ... ?
(e) Is 458 a term in the sequence 5, 12, 19, 26, ... ?

Question 6: Which term in the sequences below is the first to be greater than 250?

(a) 9, 13, 17, 21, … …

(b) 2, 10, 18, 26, … …

(c) 1, 7, 13, 19, … …

Question 7: Find the nth term for each of the following sequences

(a) $\dfrac{1}{2}$, $\dfrac{3}{4}$, $\dfrac{5}{6}$, $\dfrac{7}{8}$, … …

(b) $\dfrac{9}{11}$, $\dfrac{13}{16}$, $\dfrac{17}{21}$, $\dfrac{21}{26}$, … …

(c) $\dfrac{3}{7}$, $\dfrac{6}{12}$, $\dfrac{9}{17}$, $\dfrac{12}{22}$, … …

(d) $\dfrac{1}{2}$, $\dfrac{2}{3}$, $\dfrac{3}{4}$, $\dfrac{4}{5}$, … …

(e) $\dfrac{20}{21}$, $\dfrac{25}{32}$, $\dfrac{30}{43}$, $\dfrac{35}{54}$, … …

(f) $\dfrac{99}{100}$, $\dfrac{97}{95}$, $\dfrac{95}{90}$, $\dfrac{93}{85}$, … …

Question 8: Find the 20th term for each of the sequences in Question 7.

Apply

Question 1: Calculate the difference between the 10th term and 50th term of the sequence
9, 14, 19, 24, … …

Question 2: Calculate the sum of the 100th term and 200th term of the sequence
6, 15, 24, 33, … …

Question 3: Calculate the difference between the 30th term and 60th term of the sequence
8, 3, -2, -7, … …

Question 4:   Here are the nth terms of 4 sequences.

Sequence 1   nth term $4n + 3$
Sequence 2   nth term $7n + 1$
Sequence 3   nth term $14n$
Sequence 4   nth term $8n - 1$

For each sequence state whether the numbers in the sequence are

A   Always multiples of 7
S   Sometimes multiples of 7
N   Never multiples of 7

Sequence 1 ....   Sequence 2 ....   Sequence 3 ....   Sequence 4 ....

Question 5:   Can you spot any mistakes?

A sequence of numbers is shown below.

+7   +7   +7

8   15   22   29   ...   ...

(a) Find an expression for the *n*th term of the sequence.

$n + 7$
....
(2)

(b) Explain why 96 will not be a term in this sequence.

96 is not a multiple of 7
....
....
(2)

Intelligent Practice

Generate the first 5 terms of each sequence:

1) $2n$

2) $3n$

3) $4n$

4) $4n + 1$

5) $4n + 7$

6) $4n - 2$

7) $4n - 10$

8) $n - 10$

9) $n + 10$

10) $\frac{1}{2}n + 10$

11) $\frac{1}{2}n + 5$

12) $-\frac{1}{2}n + 5$

13) $-\frac{1}{2}n - 5$

14) $-n - 5$

15) $-7n - 5$

16) $-14n - 10$

Fluency Practice

2	342	199	11	2	35	62	190	21	9
370	505	153	51	25	6	13	6	403	60
-3	189	-10	19	8	-210	-7	39	198	907
200	55	3	14	310	15	14	457	10	105
17	14	33	150	28	340	38	15	-1	66
10	4	100	27	692	-130	303	11	83	385
306	10	6	598	233	13	198	25	107	253
100	-1	15	52	89	5	30	175	109	18
255	690	803	7	5	43	19	6	20	-280
16	8	-9	4	19	298	-460	10	-10	398
11	10	250	394	59	25	97	397	22	3
199	30	101	18	16	18	53	9	201	503
28	58	160	195	4	100	399	55	40	7
2	342	199	11	2	35	62	190	21	9
370	505	153	51	25	6	13	6	403	60
-3	189	-10	19	8	-210	-7	39	198	907
200	55	3	14	310	15	14	457	10	105

n^{th} term	1st term	2nd term	5th term	10th term	50th term	100th term
$2n + 1$						
$4n - 2$						
$5n + 3$						
$2n$						
$3n + 3$						
$7n - 8$						
$n + 5$						
$n + 9$						
$2n - 11$						
$9n + 7$						
$6n - 2$						
$7n - 10$						
$8n + 3$						
$200 - n$						
$400 - 3n$						
$3n + 10$						
$4n - 1$						
$5n + 5$						
$40 - 5n$						
$20 - 3n$						

Work out the terms in the sequences above, and then cross off each number in the grid at the top of this page. Some numbers appear in the top grid more than once – only cross one off at a time. When you're done, there will be 10 numbers left in the top grid. Add them all up!

Problem Solving

Here are the nth terms for 6 different linear sequences:

3n + 5	2n - 1	34 − 5n
n - 6	33 − 4n	3n - 7

How many of the sequences above do each of the following numbers appear in?

-6, -3, -1, 17, 26, 29

Order the numbers in order of which appears in the most to the least

773 is in the following sequences:

2n + a

3n + b

4n + c

5n + d

6n + e

Find the value of a, b, c, d and e

A1
Write down the first four terms of the sequence given by the formula:
$$6n$$

A2
Write down the first three terms of the sequence given by the formula:
$$3n + 2$$

A3
Write down the 10th term of the sequence given by the formula:
$$20 - 4n$$

A4
Write down the 51st term of the sequence given by the formula:
$$\frac{n+5}{2}$$

B1
Write down the first five terms of the sequence given by the formula:
$$n^2$$

B2
Write down the first four terms of the sequence given by the formula:
$$n^2 - 3n$$

B3
Write down the 15th term of the sequence given by the formula:
$$n(n+1)$$

B4
Write down the 99th term of the sequence given by the formula:
$$(n+2)(n-3)$$

C1
Write down the first four terms of the sequence given by the formula:
$$3^n$$

C2
Write down the first five terms of the sequence given by the formula:
$$2^n - 1$$

C3
Write down the 10th term of the sequence given by the formula:
$$4 \times 2^n$$

C4
Write down the 100th term of the sequence given by the formula:
$$(-1)^n$$

D1
Write down the first six terms of the sequence given by the formula:
$$n^3$$

D2
Write down the first four terms of the sequence given by the formula:
$$\frac{n-1}{3}$$

D3
Write down the 11th term of the sequence given by the formula:
$$(n+1)(n-3)(n+5)$$

D4
Write down the 19th term of the sequence given by the formula:
$$\frac{n^2+5}{n-4}$$

Fluency Practice

A1 Find the next two terms
2, 5, 8, 11, …

A2 Find the next two terms
11, 8, 5, 2, …

A3 Find the next two terms
9, 13, 17, 21, …

A4 Find the next two terms
23, 14, 5, –4, …

B1 Find the 20th term
11, 14, 17, 20, …

B2 Find the 30th term
5, 13, 21, 29, …

B3 Find the 45th term
2, 7, 12, 17, …

B4 Find the 51st term
30, 23, 16, 9, …

C1 Find the first three terms
nth term = $3n + 4$

C2 Find the first four terms
nth term = $2n + 7$

C3 Find the first three terms
nth term = $7n – 5$

C4 Find the first five terms
nth term = $11 – 3n$

D1 Find the nth term formula
3, 11, 19, 27, …

D2 Find the nth term formula
7, 11, 15, 19, …

D3 Find the nth term formula
4, 5, 6, 7, …

D4 Find the nth term formula
39, 33, 27, 21, …

Fluency Practice

Work out the first four terms of the sequence with these nth terms.

(a) $n + 1$ (b) $n + 2$

(c) $2n + 1$ (d) $2n + 2$

(e) $3n + 2$ (f) $3n - 2$

(g) $0.5n + 3$ (h) $6 - n$

(i) $12 - n$ (j) $12 - 2n$

Find the nth term for each of these sequences.

(a) $4, 7, 10, 13, \ldots$

(b) $5, 8, 11, 14, \ldots$

(c) $5, 9, 13, 17, \ldots$

(d) $4, 8, 12, 16, \ldots$

(e) $0, 4, 8, 12, \ldots$

(f) $4, 5, 6, 7, \ldots$

(g) $10, 8, 6, 4, \ldots$

(h) $10, 5, 0, -5, \ldots$

(i) $10, 9, 8, 7, \ldots$

(j) $-10, -9, -8, -7, \ldots$

Find the nth term of these sequences.

(a) $1.5, 2, 2.5, 3, \ldots$

(b) $4.2, 4.4, 4.6, 4.8, \ldots$

(c) $8, 7.5, 7, 6.5, \ldots$

(d) $-2, -2.5, -3, -3.5, \ldots$

Find the 100th term of these sequences.

(a) $5, 9, 13, 17, \ldots$

(b) $3, 9, 15, 21, ..$

(c) $1.5, 3, 4.5, 6, \ldots$

(d) $4, 2, 0, -2, \ldots$

(e) $\frac{1}{2}, 1, \frac{3}{2}, 2, \ldots$

(f) $-3, -5, -7, -9, \ldots$

Fluency Practice

nth term: arithmetic sequences.

Can you match each sequence to its 10th term and nth term rule?

Sequence

- 1,4,7,10,...
- 2,8,14,20,...
- 18,14,10,6,...
- -4,-1,2,5,...
- 0.1,0.4,0.7,1,...
- 9,11,13,15,...
- -0.8,-1,-1.2,-1.4,...
- 5,10,15,20,...

10th term

- 23
- -2.6
- 28
- 50
- -18
- 27
- 56
- 2.8

nth term

- 5n
- -7+3n
- 9 + 2(n-1)
- 6n-4
- 0.3n-0.2
- 3n-2
- -0.2n-0.6
- 22-4n

Workout

Purposeful Practice

Question 1: These patterns are made from sticks

Pattern 1   Pattern 2   Pattern 3

(a) Draw pattern 4
(b) Draw pattern 5
(c) How many sticks will there be in pattern 6?
(d) How many sticks will there be in pattern 10?
(e) Which pattern will use 31 sticks?

Theo says that he has made a pattern with exactly 100 sticks.

(f) Explain why Theo must be wrong.

Question 2: Here are some patterns of dots
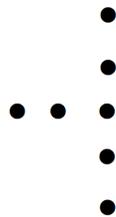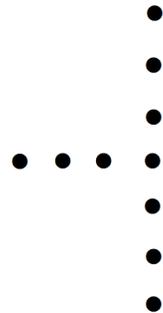
Pattern 1   Pattern 2   Pattern 3

(a) Continue the pattern to show pattern 4
(b) How many dots will there be in pattern 6?
(c) Which pattern will use 28 dots?
(d) Which pattern will use 43 dots?

Pattern 800 has 2401 dots.

(e) How many dots will pattern 801 have?
(f) How many dots will pattern 799 have?

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Question 3:   The patterns below are made from sticks

(a) Complete the table for pattern 4.

Pattern 1
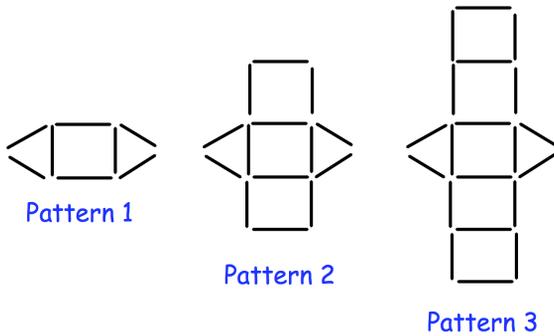
Pattern 2

Pattern 3

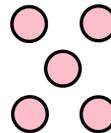| Pattern Number	1	2	3	4
Number of Sticks	8	14	20	

(b) Sketch pattern 5.

Here is a rule for working out the number of sticks

Multiply pattern number by 6 and add 2

(c) How many sticks will be in pattern 30?
(d) How many sticks will be in pattern 120?
(e) Which pattern will have 80 sticks?
(f) Which pattern will have 482 sticks?

Question 4:   The diagram shows a sequence of patterns

(a) Draw pattern 4.
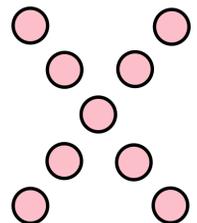
(b) Work out the number of circles
    in pattern 5.

Pattern 1   Pattern 2   Pattern 3

(c) Write down a rule for continuing the patterns.

(d) Explain why you **cannot** make a pattern with exactly 66 circles.

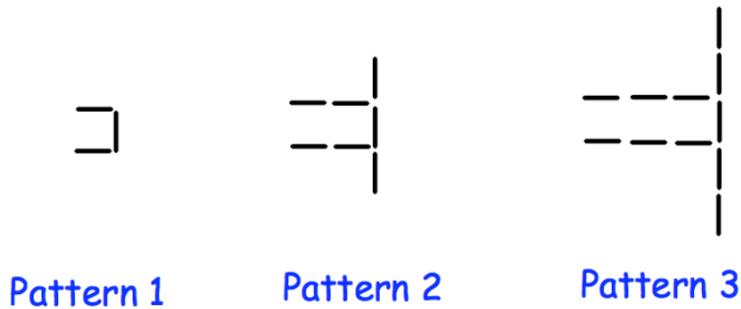(e) Complete this rule

Number of circles = Pattern number x ☐ – ☐

Corbett maths
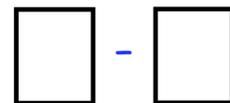
Question 5: The patterns below are made from sticks.

Pattern 1   Pattern 2   Pattern 3

(a) Write an expression, in terms of n, for the number of sticks in pattern *n*
(b) How many sticks will there be in pattern 55?
(c) Which pattern number will use exactly 100 sticks?

Question 6: These patterns are made from sticks.

Pattern 1   Pattern 2   Pattern 3

(a) Write an expression, in terms of n, for the number of sticks in pattern *n*
(b) How many sticks will there be in pattern 220?
(c) Which pattern number will use exactly 139 sticks?

Question 7: The patterns below are made from squares and triangles.

Pattern 1   Pattern 2   Pattern 3
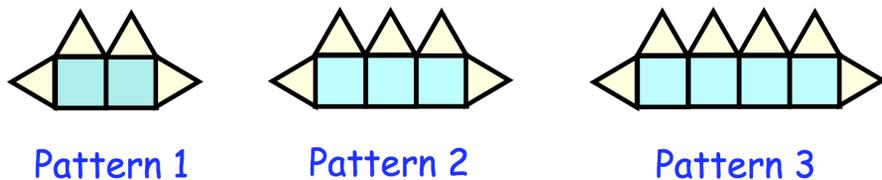
(a) How many triangles are there in pattern 6?
(b) How many squares are there in pattern 7?

(c) Write an expression, in terms of n, for the number of squares in pattern *n*
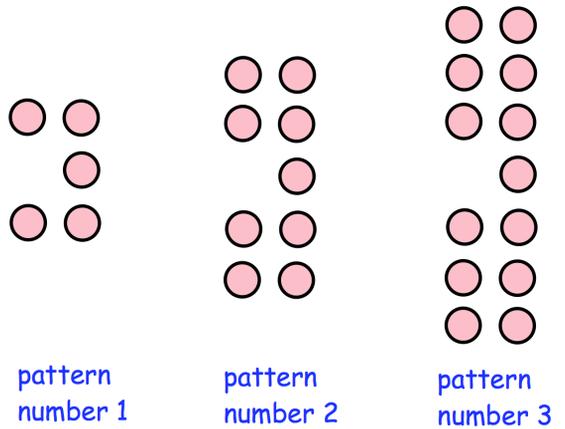(d) Write an expression, in terms of n, for the number of triangles in pattern *n*

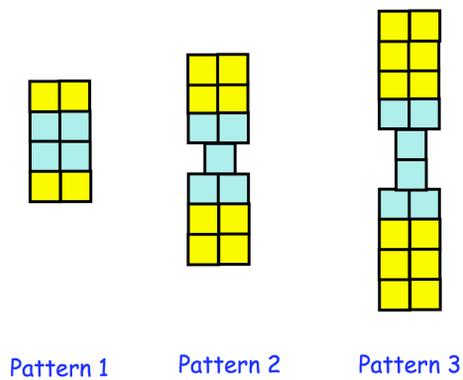Question 1:   Here is a pattern made with circular discs.

(a) Find an expression, in terms of n, for the
      number of discs in pattern number n.

Olivia has 103 discs.

(b) Can Olivia make a pattern in this sequence
      using exactly 103 discs?
      Explain your answer.

pattern
number 1

pattern
number 2

pattern
number 3

Question 2:   Here is a pattern of blue and yellow squares.

Pattern 1   Pattern 2   Pattern 3

Which statements below are true?

A Pattern 5 has 9 blue squares

B The number of yellow squares is always even

C Pattern 10 has 50 squares in total

D Every pattern has more yellow than blue squares

E Pattern 7 has 28 yellow squares

F The number of blue squares in Pattern 16 is a
       prime number

Answers

✓ ✗

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Fluency Practice

①

Sequences with Shape

1) These are the first 3 shapes in a sequence. Complete the table.

1st 2nd 3rd

Why is it easy to predict the squares in the 10th & 20th shapes?

Shape	Squares
1st	2
2nd	4
3rd	
4th	
5th	
10th	
20th	

2) This is a **similar** sequence with white & grey squares. Complete the table.

1st 2nd 3rd

Describe how you would calculate the squares in the 100th shape.

Using **n** to represent the shape number, write an **algebraic expression** for the number of squares in **any** shape in the sequence.
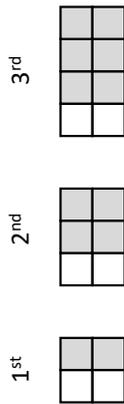
Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
5th	
10th	
20th	
30th	

3) Complete the table for this sequence of shapes.

1st 2nd 3rd

Use the last row to write an algebraic expression for the sequence.

Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^th	

4) Complete the table for this sequence of shapes.

1st 2nd 3rd

Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^th	

5) Complete the tables for these sequences.
Think about the 'common difference' between shapes, & how many squares need to be added to make the sequence correct.
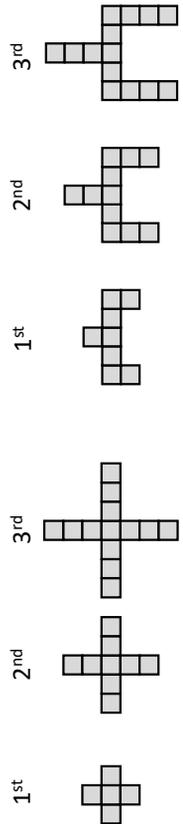
1st 2nd 3rd

Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^th	

1st 2nd 3rd

Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
8th	
15th	
n^th	

6) What is the nth term for these 2 different sequences?

1st 2nd 3rd

1st 2nd 3rd

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Fluency Practice

Sequences with Shape

1) These are the first 3 shapes in a sequence. Complete the table.

1st   2nd   3rd

Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
20th	
n^{th}	

Use the last row to write an algebraic expression for the sequence.

For each of the next shape sequences write an algebraic expression for the nth term. A table might help you.

Think about the 'common difference' between shapes, & how many squares need to be added to make the sequence correct.
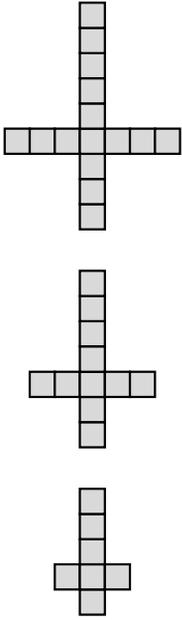
1st   2nd   3rd

Complete the table for this sequence, how is it different?

Shape (n)	Total Squares
1st	
2nd	
3rd	
4th	
10th	
n^{th}	
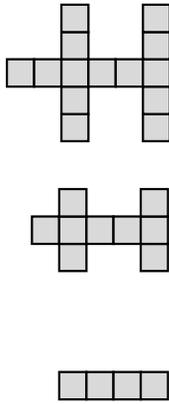
The sequence increases by 5 each time, but it begins lower than 5. We must adjust the sequence by subtracting one.
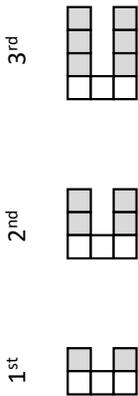
Find the nth term for these sequences.
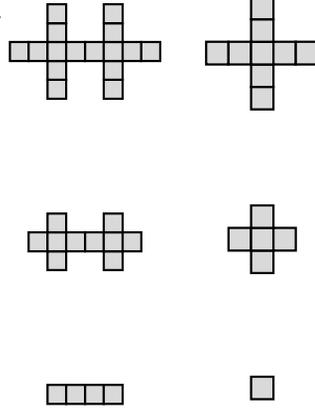
Try finding the nth term for these numerical sequences.

a) 6, 10, 14, 18, 22

b) 4, 9, 14, 19, 24

c) 3, 11, 19, 27

d) 8, 6, 4, 2

Page 200
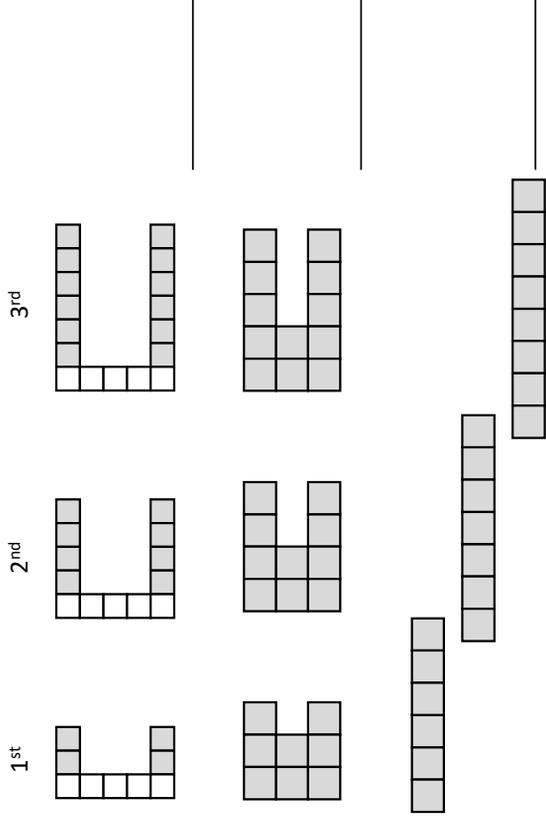
Fluency Practice

Sequences: Area & Perimeter

For each sequence, sketch the next shape & complete the table.
Try to find an algebraic expression for the values for **any** shape in the sequence (the nth term).
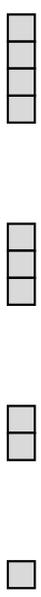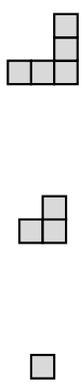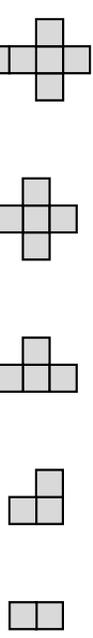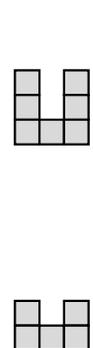
A

	1st	2nd	3rd	4th	nth
Squares	1				n
Perimeter	4				$2n + 2$

B

	1st	2nd	3rd	4th	nth
Squares					
Perimeter					

C

	1st	2nd	3rd	4th	nth
Squares					
Perimeter					

D

	1st	2nd	3rd	4th	nth
Squares					
Perimeter					

E

	1st	2nd	3rd	4th	5th	nth
Squares						
Perimeter						

F

	1st	2nd	3rd	4th	nth
Squares					
Perimeter					

G
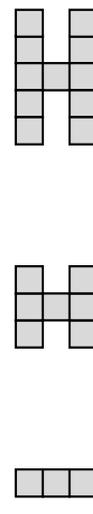
	1st	2nd	3rd	4th	5th	nth
Squares						
Perimeter						

H

	1st	2nd	3rd	4th	5th	6th	nth
Squares							
Perimeter							

I
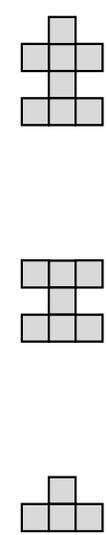
	1st	2nd	3rd	4th	5th	6th	nth
Squares							
Perimeter							
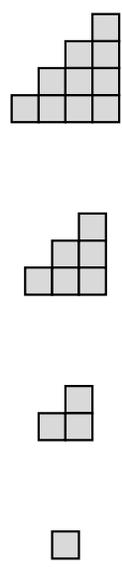
J

	1st	2nd	3rd	4th	5th	6th	7th	nth
Squares								
Perimeter								

Fluency Practice

Question 1:   The first 4 numbers in the Fibonacci sequence are $1, 1, 2, 3, \ldots$

(a) What is the 5th term of the Fibonacci sequence?
(b) What is the 6th term of the Fibonacci sequence?
(c) Describe the rule for continuing the Fibonacci sequence.

Question 2:   Find the next three terms of the following Fibonacci-style sequences

(a) $2, 4, 6, 10, \ldots$ (b) $3, 6, 9, 15, \ldots$ (c) $4, 8, 12, 20, \ldots$

(d) $15, 23, 38, 61, \ldots$ (e) $5, 12, 17, 29, \ldots$ (f) $-3, 5, 2, 7, \ldots$

(g) $35, 60, 95, 155, \ldots$ (h) $-1, \ -3, \ -4, \ -7, \ldots$ (i) $1.2, 2.7, 3.9, 6.6, \ldots$

(j) $0.11, 2.32, 2.43, 4.75, \ldots$ (k) $-5.1, 1.1, \ -4, \ -2.9, \ldots$ (l) $-0.5, \ -0.7, \ -1.2, \ -1.9, \ldots$

(m) $\dfrac{1}{11}, \ \dfrac{3}{11}, \ \dfrac{4}{11}, \ \dfrac{7}{11}, \ \ldots$ (n) $\dfrac{5}{6}, \ \dfrac{11}{12}, \ \dfrac{7}{4}, \ \dfrac{8}{3}, \ \ldots$ (o) $-\dfrac{1}{5}, \ \dfrac{1}{2}, \ \dfrac{3}{10}, \ \dfrac{4}{5}, \ \ldots$

Question 3: Find the missing term in each of the Fibonacci-style sequences below.

(a) $\square$, $13, 20, 33, \ldots$ (b) $11, \square$, $26, 41, \ldots$ (c) $\square$, $69, 109, 178, \ldots$

(d) $\square$, $3.7, 4.9, 8.6, \ldots$ (e) $26.3, \square$, $64.4, 102.5, \ldots$ (f) $10.25, \square$, $25.75, 41.25, \ldots$

(g) $6, \square$, $4, 2, \ldots$ (h) $-12, \square$, $-4, 4, \ldots$ (i) $\square$, $-\dfrac{5}{4}, \ -2, -\dfrac{13}{4} \ldots$

Apply

Question 1: For each of the following Fibonacci-style sequences, find the next 4 terms.

(a) $a, 4a, 5a, 9a, \ldots$ (b) $3x, 3x + y, 6x + y, 9x + 2y, \ldots$

(c) $6a, \ -2a, 4a, 2a, \ldots$ (d) $2y, y + z, 3y + z, \ldots$

(e) $4x - 5y, 2x - y, 6x - 6y, \ldots$ (f) $-x, x + y, y, \ldots$

Question 2: Beth wants to generate a Fibonacci style sequence.
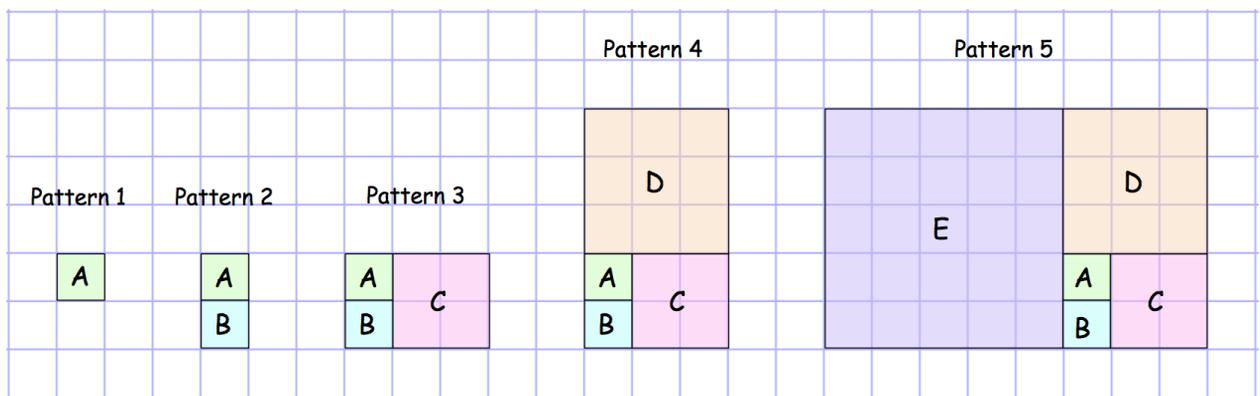The first term is 3 and the second term is 4.

(a) Find the 3rd term.
(b) Find the 4th term.

Beth thinks that the sum of the first ten terms is equal to 11 times the 7th term of her sequence.

(c) Show that Beth is correct.

Question 3: Using the first term of x and the second term of y, prove your answer to Question 2 (c).

Question 4: Ethan generates the pattern below

(a) Draw Pattern 6
(b) What is the length of each side of square F?
(c) What is the length of each side of square G?
(d) What is the length of each side of square H?
(e) What do you notice about your answers to (b), (c) and (d)?

Question 5: Dylan is researching what happens when a term in the Fibonacci sequence is divided by the term before it.

(a) Find the missing answers
(b) What do you notice?
(c) Research the Golden Number.

$1 \div 1 = 1$
$2 \div 1 = 2$
$3 \div 2 = 1.5$
$5 \div 3 = 1.666...$
$8 \div 5 =$
$13 \div 8 =$
$21 \div 13 =$

Click here

Purposeful Practice

Determine whether each of these sequences is a Fibonacci-like sequence.

(a) $1, 1, 2, 3, 5, 8, 13, \ldots$

(b) $1, 2, 3, 6, 11, 20, 37, \ldots$

(c) $2, 4, 6, 10, 16, 26, \ldots$

(d) $-1, 3, 2, 5, 7, 12, \ldots$

Find the next four terms in each of these Fibonacci-like sequences.

(a) $2, 5,$ ____ , ____ , ____ , ____ , ...

(b) $3, 4,$ ____ , ____ , ____ , ____ , ...

(c) $1, 3,$ ____ , ____ , ____ , ____ , ...

(d) $-2, 4,$ ____ , ____ , ____ , ____ , ...

(e) $1.6, 4.3,$ ____ , ____ , ____ , ____ , ...

(a) The first two terms of a Fibonacci sequence are the first two prime numbers. Find the next four terms in the sequence.

(b) The first two terms of a Fibonacci sequence are the first two triangular numbers. Find the next four terms in the sequence.

(a) Milly think that 70 is in the Fibonacci-like sequence that starts $6, 10, 16, 26, \ldots$ Is Milly correct? Explain your answer.

(b) A Fibonacci-like sequence contains the third term 10. Suggest two possible sequences and give their first five terms.

(c) The sum of the first three terms of a Fibonacci-like sequence is zero. What is the third term?

(d) The first two terms of a Fibonacci-like sequence are a and $2a$. Find the next five terms of the sequence.

Purposeful Practice

Fibonacci Sequences with Algebra

Using algebra, how can we **express** the next terms of these sequences?

F	0	n	2n
G	1	n	n+1
H	n	2	
I	n−1	n	
J	2n−3	n+1	
K	5−3n	n−2	

Complete these Fibonacci-rule sequences.

P	4				42

Q	−3				11

Complete this Fibonacci-rule sequence.
How can you form an expression for the 1st term using n?

R	−2	n			6

Create a similar Fibonacci-rule sequence where the third number is n.
Express each term algebraically.

This is the Fibonacci sequence. The first two terms are 0 & 1.
To find the next term, we add the previous 2.
Complete the 8th, 9th & 10th terms.

0	1	1	2	3	5	8			

These are Fibonacci-rule sequences but they don't start with 0 & 1.
Complete the missing terms

A		2	4	6	
B			10		25
C				24	39
D		0		12	
E		−2		2	

Using algebra, find the value of n & complete these sequences.

L	Algebra:	n	n+1			
	Number:			8		

M	Algebra:	n	n+4			
	Number:				17	

N	n−1	n			37	

O	n−4	2n+2			37	

Intelligent Practice

1) Is 101 in the sequence 1, 4, 7, 10, 13, ...?

2) Is 101 in the sequence 4, 7, 10, 13, 16, ...?

3) Is 101 in the sequence 5, 8, 11, 14, 17, ...?

4) Is 101 in the sequence 5, 9, 13, 17, 21, ...?

5) Is 1010 in the sequence 50, 90, 130, 170, 210, ...?

6) Is −101 in the sequence 13, 10, 7, 4, 1, ...?

7) Is −110 in the sequence 16, 13, 10, 7, 4, ...?

8) Is −110 in the sequence 17, 14, 11, 8, 5, ...?

9) Is −101 in the sequence 21, 17, 13, 9, 5, ...?

10) Is −1010 in the sequence 210, 170, 130, 90, 50, ...?

Purposeful Practice

(a) The first four terms of a sequence are $3, 7, 11, 15, \ldots$ Is 50 in the sequence? Explain your answer.

(b) The first four terms of a sequence are $-4, -2, 0, 2, \ldots$ Is 33 in the sequence? Explain your answer.

(c) The first four terms of a sequence are $1, 6, 11, 16, \ldots$ Is 41 in the sequence? Explain your answer.

(a) The first four terms of a sequence are $6, 9, 12, 15, \ldots$ Is 39 in the sequence? Explain your answer.

(b) The first four terms of a sequence are $7, 10, 13, 16, \ldots$ Is 67 in the sequence? Explain your answer.

(c) The first four terms of a sequence are $5, 8, 11, 14, \ldots$ Is 40 in the sequence? Explain your answer.

(a) The nth term of a sequence is $3n - 2$. Is 95 a term of the sequence? Explain your answer.

(b) The nth term of a sequence is $5n + 3$. Is 118 a term of the sequence? Explain your answer.

(c) The first four terms of a sequence are $7, 11, 15, 19, \ldots$ Is 97 in the sequence? Explain your answer.

(d) The first four terms of a sequence are $-2, 5, 12, 19, ..$ Is 110 in the sequence? Explain your answer.

(a) How many terms in the sequence $5, 9, 13, 17, \ldots$ are less than 200?

(b) Find two numbers that are in the sequence $7, 12, 17, 22, \ldots$ and also in the sequence $-4, 2, 8, 14, \ldots$

Fluency Practice

arithmetic sequences

Work out what is happening in the sequences.
Can you figure out the missing terms?

A	7	12	17	22		
B	5	8	11	14		
C	16	13	10	7		
D	15	9	3	-3		
E	22	14	6			
F	9		15		21	
G	-3		5		13	

H	-2			-8		
I	-12			-3		
J	0.1		0.14		0.18	
K		0.24		0.18		
L		-1.3	-1.36			
M	$\frac{1}{2}$	1	$\frac{3}{2}$			
N	$\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{5}{4}$		
O	$\frac{1}{8}$	$\frac{1}{4}$		$\frac{1}{2}$		
P	$\frac{1}{5}$		1		$\frac{9}{5}$	

Fluency Practice

decimal sequences

Work out the missing numbers in each of these sequences

A)	0.1	0.4	0.7			
B)	0.01	0.05	0.09			
C)	1.55	1.7	1.85			
D)	1.09	1.2	1.31			
E)	4.15	4.1	4.05			
F)	3.65	3.5	3.35			
G)	1.01		1.07		1.13	
H)	2.6		2.52		2.44	
I)	0.6		1.8		3	
J)	0.5			1.1			1.7
K)	0.05			0.23			0.41
L)	2.06						1.46
M)	1.05					0.85	

Fluency Practice

A. Fill in the missing words from the list on the right:

A sequence is a set of numbers that follow a ....

Another word for .... is ....

The .... rule tells us how to get from one number in a sequence to the next.

In an **arithmetic** sequence the term-to-term rule involves .... or .... the same number each time.

In **geometric** sequences the term to term rule involves .... or dividing by the .... number each time.

A **Fibonacci** sequence is one where we have to add the .... two .... together in order to get the next term.

term-to-term

rule

same

previous

progression

multiplying

sequence

adding

terms

subtracting

- -

B. Work out the next two terms of each sequence and the type of sequence.

A	1	1	2	3			
B	4	7	10	13			
C	10	1	0.1	0.01			
D	-1	-3	-5	-7			
E	3400	340	34	3.4			
F	4	5	9	14			
G	2	4	8	16			
H	0.1	0.25	0.4	0.55			
I	0.1	0.2	0.3	0.5			
J	8	-4	2	-1			
K	-2	-3	-5	-8			

Fluency Practice

For each of the sequences given, decide whether it is special, arithmetic, quadratic or geometric, then write down the next two terms.

(a) $1, 1, 2, 3, 5, 8, \ldots$

(b) $4, 7, 10, 13, \ldots$

(c) $2, 4, 8, 16, \ldots$

(d) $10, 8, 6, 4, 2, \ldots$

(e) $1, 3, 6, 10, 15, \ldots$

(f) $160, 80, 40, 20, \ldots$

(g) $2, 5, 10, 17, \ldots$

(h) $1, 3, 5, 7, 9, \ldots$

Generate the first four terms of the sequences with nth terms:

(a) $2n$ (b) $3n - 1$

(c) n^2 (d) $20 - n$

(e) $7 - 3n$ (f) $n^2 + 5n$

(g) $2n^2 - 1$ (h) $\frac{n(n+1)}{2}$

Generate the 6th and 20th terms of the sequences with nth terms:

(a) $4n - 1$ (b) $n + 10$

(c) $1 + n^2$ (d) $50 - 5n$

(e) $-1 - n$ (f) $n^2 - 2n$

(g) $3n^2 + n + 1$ (h) $\frac{n+1}{n+2}$

(a) Find the first term in the sequence with nth term $5n + 7$ that is greater than 250.

(b) Find the first term in the sequence with nth term $150 - 8n$ that is a negative number.

(c) Find the only number that is in both the sequences with nth term rules $2n - 9$ and $17 - 7n$.

Fluency Practice

For each of the sequences given, decide whether it is special, arithmetic, quadratic or geometric, then write down the next two terms.

(a) 1, 1, 2, 3, 5, 8,…

(b) 4, 7, 10, 13,…

(c) 2, 4, 8, 16,…

(d) 10, 8, 6, 4, 2,…

(e) 1, 3, 6, 10, 15,…

(f) 160, 80, 40, 20,…

(g) 2, 5, 10, 17,…

(h) 1, 3, 5, 7, 9,…

For each of these sequences, draw the next two patterns in the sequence.

(a)

(b)

(c)
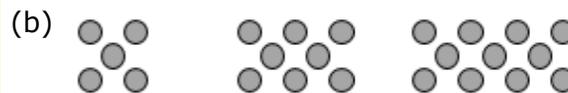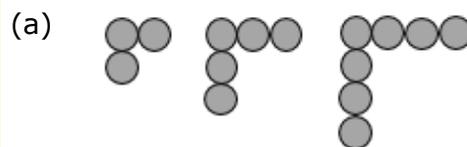
The first three terms of a Fibonacci sequence are:

a $\quad$ b $\quad$ $a+b$

Show that the 6th term is $3a + 5b$

Purposeful Practice

(3)

What type of sequence would make the second and fourth terms sum to 180?

(4)

What type of sequence would make the third term look like this?

(2)

What type of sequence would make the mean of the first four terms equal their median?

Sequences

6 , $\boxed{}$, $\boxed{54}$, $\boxed{}$, ...

(5)

What type of sequence would make the fourth term 81?

(1)

What type of sequence would make the second term 48?

(7)

For each of the sequences in **(2)** to **(5)**, find the nth term.
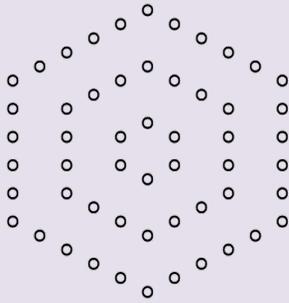
(6)

For each of the sequences in **(1)** to **(5)**, find the 8th term.

Problem Solving

1) Assuming that each pair of numbers is the start of an arithmetic sequence, find:
   (i) the next three terms, (ii) the nth term rule, (iii) the 200th term.

2) Assuming that each pair of numbers is the start of a geometric sequence, find:
   (i) the next three terms, (ii) the ratio between the first and third terms,
   (iii) the ratio between the second and fifth terms.

a) $\dfrac{1}{2}, \dfrac{3}{2}$

b) $\dfrac{1}{2}, \dfrac{3}{4}$

c) $\dfrac{1}{2}, \dfrac{3}{8}$

d) $\dfrac{1}{3}, 3$

e) $\dfrac{1}{3}, \dfrac{1}{4}$

f) $\dfrac{1}{4}, \dfrac{2}{3}$

g) $\dfrac{1}{4}, 1\dfrac{2}{3}$

h) $\dfrac{1}{4}, -1\dfrac{1}{2}$

i) $2\dfrac{1}{3}, 3\dfrac{1}{2}$

j) $3\dfrac{1}{2}, 2\dfrac{1}{3}$

k) $2\dfrac{1}{3}, -3\dfrac{1}{2}$

l) $-3\dfrac{1}{2}, 2\dfrac{1}{3}$

Problem Solving

Choose some starting numbers and write them in the boxes on the left.
You should not repeat any sequences.

| | | | Is an increasing linear sequence with n^{th} term | |

Change 1 number

| | | | Is not a linear sequence |

Change 1 number

| | | | Is an increasing linear sequence with n^{th} term | |

Change the number marked with ★

| * | | | Is not a linear sequence |

Change 1 number

| | | | Is an increasing linear sequence with n^{th} term | |

Change 1 number

| | | | Is not a linear sequence |

Change 1 number

| | | | Is an increasing linear sequence with n^{th} term | |

Change at least one number, but not the one marked ✚

| | | ✚ | Is an increasing linear sequence with n^{th} term | |

Change 1 number

| | | | Is not a linear sequence |

Change 1 number

| | | | Is an increasing linear sequence with n^{th} term | |

Change 1 number

| | | | Is not a linear sequence |

Change 2 numbers

| | | | Is a decreasing linear sequence with n^{th} term | |

Change 2 numbers

| | | | Is an increasing linear sequence with n^{th} term | |

Change 1 number

| | | | Is not a linear sequence |

Change 2 numbers

| | | | Is not a linear sequence |

Change 1 number

| | | | Is an increasing linear sequence with n^{th} term | |

Problem Solving

the expressions are the first four consecutive terms in an arithmetic sequence for one value of 'n'
find the value of 'n'

(a)

1) $4n + 2$

2) $5n + 3$

3) $8n$

4) 19

(b)

1) $3n + 1$

2) $4n - 1$

3) $4n + 3$

4) $5n + 1$

(c)

1) $n - 4$

2) $2(n - 2)$

3) $n + 2$

4) $3n - 1$

(d)

1) $2n + 1$

2) $4n$

3) $7n - 5$

4) $7n + 2$

(e)

1) $\frac{1}{2}(n + 19)$

2) $3n$

3) $5n - 6$

4) $5n + 2$

(f)

1) $\frac{2}{3}n$

2) $n - 7$

3) $\frac{1}{2}(n - 13)$

4) $3 - n$

(g)

1) $n - 1$

2) $18 - n$

3) $4n + 2$

4) $41 - 2n$

(h)

1) $3n - 33$

2) $4 - n$

3) $2n - 29$

4) $-2 - n$

Problem Solving

the following expressions are an arithmetic sequence, in order, for one value of 'n'

(a)

1) $2n - 9$

2) $n + 7$

3) $3n - 1$

4) $5n - 9$

5) $4n + 7$

(b)

1) $2n + 1$

2) $n + 11$

3) $3(n - 1)$

4) $n + 15$

5) $2n + 9$

(c)

1) $3(n - 4)$

2) $n + 5$

3) $2n + 7$

4) $6(n - 1)$

5) $4n + 11$

(d)

1) $5n - 9$

2) $7n - 16$

3) $4n + 17$

4) $2(4n - 3)$

5) $9(n - 1)$

(e)

1) $2n - 3$

2) $4n$

3) $3(2n + 1)$

4) $9n - 4$

5) $11n - 2$

(f)

1) $3n - 8$

2) $n + 10$

3) $28 - n$

4) $46 - 3n$

5) $n - 2$

(g)

1) $2n + 7$

2) $28 - n$

3) $6n$

4) $n + 26$

5) $2(2n + 7)$

(h)

1) $40 - n$

2) $7(n + 1)$

3) $19 - 3n$

4) $5n - 14$

5) $8n - 33$

Problem Solving

1) The 1st term in a sequence is 4
   and the 8th term is 46
   What is the nth term?

2) The 3rd term in a sequence is 23
   and the 5th term is 46
   What is the nth term?

3) The nth term is $2n + 6$
   Is 107 a term in the sequence?
   Give a reason for your answer.

4) The nth term is $3n - 4$.
   Is 132 a term in the sequence?
   Give a reason for your answer

5) The 1st term in a sequence is 18
   and the 9th term is 106
   Is 73 a term in the sequence?
   Give a reason for your answer

6) The 4th term in a sequence is 31
   and the 10th term is 85
   Is 98 a term in the sequence?
   Give a reason for your answer.

7) The nth term is $11n - 6$
   What is the position of the term
   225 in the sequence?

8) The nth term is $21n - 41$
   What is the position of the term
   1933 in the sequence?

9) The 10th term of a sequence is 155
   The 100th term is 1685
   And the 1000th term is 16985
   Could the sequence be linear?
   Give a reason for your answer.

10) i) What is the nth term of the
    sequence of numbers made from
    the overlap of $3n + 2$ and $5n + 4$?
    ii) Investigate for other pairs of
    sequences.

Problem Solving

First term is 10

Numbers in the sequence go up
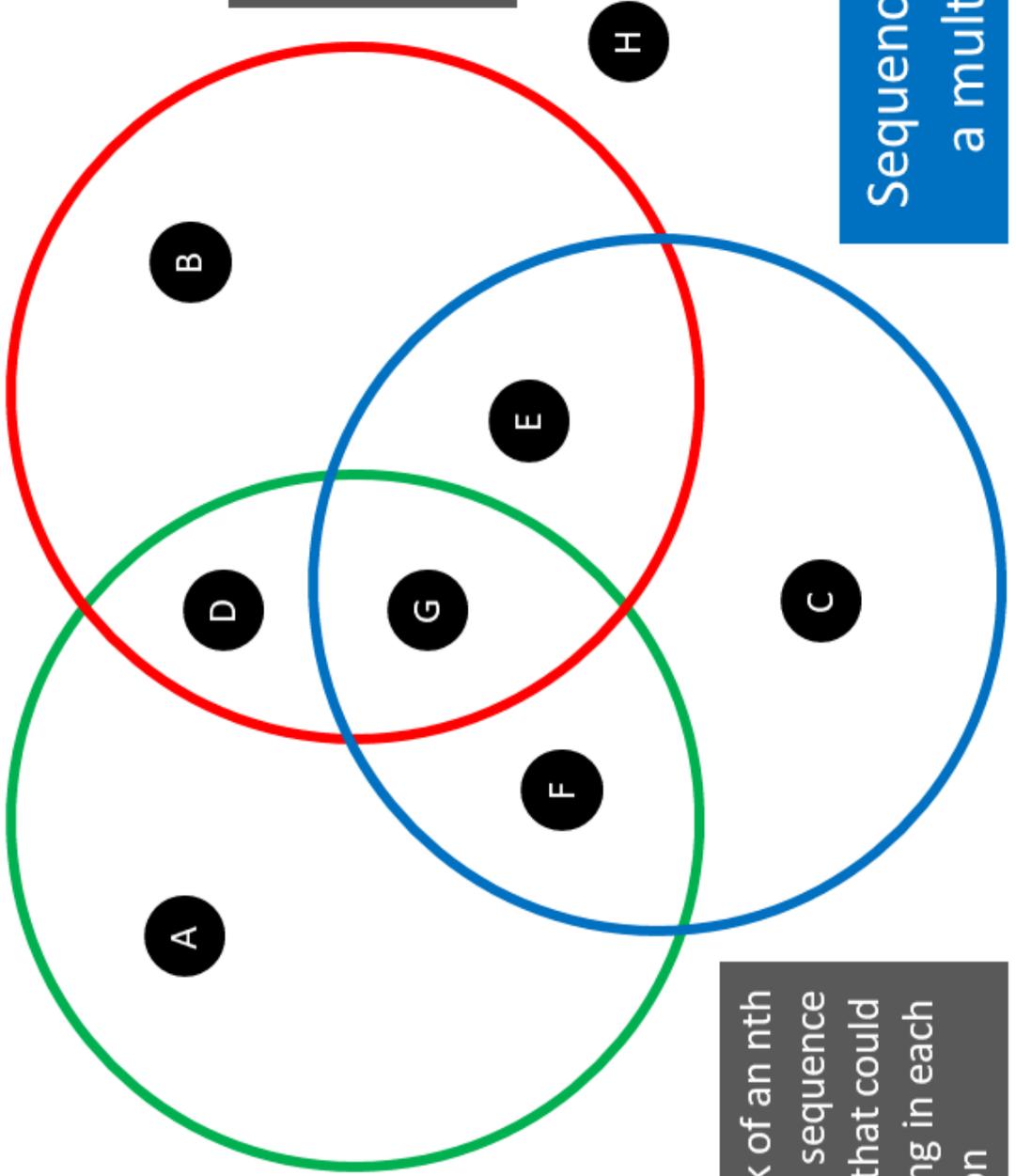
If you think a region is impossible to fill, convince me why!

Sequence contains a multiple of 4

Think of an nth term sequence rule that could belong in each region

Problem Solving

Sequence contains the number 12

If you think a region is impossible to fill, convince me why!

Sequence contains exactly 3 negative terms

Difference between each term is + or - 6

Think of an nth term sequence rule that could belong in each region

A   B   C   D   E   F   G   H