



Mathematics
 Σ
Department

ALGEBRA BOOKLET

1

SHOW ALL WORKING FOR ALL QUESTIONS

SIMPLIFYING

Exercise 1

Simplify the following

- | | | | |
|-----|-------------------|-----|-----------------|
| 1) | $6x + 2x$ | 2) | $10y - 6y$ |
| 3) | $8t + t$ | 4) | $7m + 3m - 2m$ |
| 5) | $7p + 9p + 2p$ | 6) | $12x - 3x + 4x$ |
| 7) | $9y + 2y - y$ | 8) | $8c + 3c - 6c$ |
| 9) | $12x + 7x - 2x$ | 10) | $17t - 7t - 2t$ |
| 11) | $14e + 15e - 16e$ | 12) | $8p - 2p + 10p$ |

Exercise 2

Simplify

- | | | | |
|-----|----------------|-----|----------------|
| 1) | $9x + 3x$ | 2) | $12r - 8r$ |
| 3) | $6m + 3m$ | 4) | $8b + 5b - b$ |
| 5) | $7t + 3t + 2t$ | 6) | $7c - 2c + 3c$ |
| 7) | $2f + 4f - f$ | 8) | $6a + 5a - 2a$ |
| 9) | $5e + 7e - 2e$ | 10) | $8m - m - 2m$ |
| 11) | $6t + 3t - 2t$ | 12) | $2g - g + 6g$ |

Exercise 3

- 1) $8y + 5t + 2y$
- 2) $5h + 6r - h$
- 3) $7u + 8 - 2u$
- 4) $5e + 4r + e - r$
- 5) $8k + 4r - 6k$
- 6) $9r + 2w - r - 2w$
- 7) $3e + 2w - e + 4w$
- 8) $3q + 4s - q - 3s$
- 9) $8g + 4h - 2g - 3h$
- 10) $8 + 2x - 8$
- 11) $10p + 3 - 10p - 3$
- 12) $7f - 2q + 6f - q$
- 13) $6h + 3e - 4h - e - 5h$

Exercise 4

- 1) $4x + 2y + 8x$
- 2) $4m + 8n - m$
- 3) $9k + 5 - 2k$
- 4) $7t + 3p + 4t - p$
- 5) $8v + 2w - 7v$
- 6) $2m + 2n - m - n$
- 7) $8p + 4q - 2p + 6q$
- 8) $3x + 2y - 2x - 2y$
- 9) $2e + 6f - e - 5f$
- 10) $5 + 9x - 2$
- 11) $9y + 13 - 5y - 12$
- 12) $9y - 4y + 4m - 2m$
- 13) $5t + 8w - 2t - w - 2w$

More Simplifying

Exercise 1

- | | | | |
|-----|-----------------------|-----|-----------------------|
| 1) | $8 \times p \times 2$ | 2) | $p \times p \times p$ |
| 3) | $m \times n$ | 4) | $3 \times t \times 5$ |
| 5) | $d \times d$ | 6) | $p \times p \times p$ |
| 7) | $y \times 8$ | 8) | $3 \times m \times 2$ |
| 9) | $y \times y$ | 10) | $4 \times y \times 3$ |
| 11) | $m \times 3 \times m$ | 12) | $8k \times 2k$ |

Exercise 2

- | | | | |
|-----|--------------------------------|-----|-------------------------|
| 1) | $5x \times 2$ | 2) | $3e \times 2e$ |
| 3) | $3 \times 5 \times p \times q$ | 4) | $2 \times 6 \times t$ |
| 5) | $3t \times 3t$ | 6) | $2q \times 10q$ |
| 7) | $b \times 3b$ | 8) | $m \times 5 \times m$ |
| 9) | $5h \times 2h$ | 10) | $2t \times 3t$ |
| 11) | $2a \times 3a \times 5$ | 12) | $10 \times 2n \times 3$ |

Exercise 3

- | | | | |
|-----|--------------------------|-----|--------------------------|
| 1) | $5u \times 7u \times u$ | 2) | $3v \times 3v \times 3$ |
| 3) | $10h \times 10h$ | 4) | $3j \times 3j \times 4j$ |
| 5) | $2y \times 3y \times 2y$ | 6) | $5q \times q \times q$ |
| 7) | $3f \times 2f \times 2f$ | 8) | $4x \times 6y \times t$ |
| 9) | $6j \times 2j \times 2j$ | 10) | $3h \times 2h \times 2t$ |
| 11) | $(2w)^2$ | 12) | $(3x)^3$ |

Tricky

Exercise 4
Simplify

- 1) $4 \times a$ 2) $8 \times b$ 3) $2 \times g$ 4) $k \times 9$
5) $3 \times 4 \times h$ 6) $7 \times 2 \times d$ 7) $4 \times 6 \times w$ 8) $2a \times 5b$
9) $8p \times 3q$ 10) $a \times a$ 11) $w \times w \times w$ 12) $2 \times 3a \times 3a$
13) $4p \times q \times r$ 14) $2 \times u \times 5v$ 15) $s \times t \times 4s$ 16) $a \times 6 \times a$
17) $b \times b \times c$ 18) $2 \times a \times b \times 3$ 19) $m \times m$ 20) $2f \times 3f$
21) $2w \times 4w$ 22) $f \times f \times f$ 23) $7f \times 2f \times f$ 24) $f \times 6f \times 2f$
25) $3y \times 4 \times 10y$

Exercise 5

- 1) $2 \times a + 3 \times a$ 2) $5 \times b + 7 \times b$
3) $4 \times b + 4 \times h$ 4) $6 \times w - 2 \times w$
5) $7 \times m - 6 \times m$ 6) $3 \times p + 3 \times p + 3 \times p$
7) $5 \times u + 5 \times u$ 8) $8 \times v - 4 \times v - v$
9) $10 \times m - 7 \times m$ 10) $6 \times f + 6 \times f$

Exercise 6

State which of the following are true and which are false:

- 1) $a + a = a^2$ 2) $3a \times a = 3a^2$
3) $3a \times a \times 2a = 6a^3$ 4) $b \times b \times b = 3b$
5) $2c + 2c + 2c = 6c$ 6) $d + 2d = 3d^2$
7) $3a \times 2b = 5ab$ 8) $2a + 3b = 5ab$
9) $c \times c = c^2$ 10) $5b \times 4b = 20b^2$

EXPAND AND SIMPLIFY

Exercise 1

1) $3(d + 2)$

2) $4(g + 4)$

3) $2(m + 1)$

4) $6(u + 6)$

5) $7(m + 2)$

6) $4(3 + y)$

7) $5(4 + u)$

8) $2(10 + h)$

9) $3(8 + j)$

10) $4(3 + e)$

Exercise 2

1) $3(w - 1)$

2) $4(u - 3)$

3) $6(r - 1)$

4) $7(p - 3)$

5) $4(e - 10)$

6) $4(8 - q)$

7) $5(1 - u)$

8) $7(5 - t)$

9) $8(2 - g)$

10) $8(5 - k)$

Exercise 3

1) $7(3e + 1)$

2) $4(4w + 1)$

3) $5(2r + 5)$

4) $7(5e + 3)$

5) $5(4w + 1)$

6) $7(2d + 1)$

7) $9(4r + 8)$

8) $3(5t + 7)$

9) $3(3e + 8)$

10) $5(5e + 1)$

11) $2(2 + 5r)$

12) $4(7 + 3w)$

13) $6(4 + 2y)$

14) $6(1 + 6r)$

15) $9(1 + 4w)$

16) $10(4 + 3q)$

17) $5(4 + 3u)$

Exercise 4

1) $4(4e - 3)$

2) $5(2r - 1)$

3) $7(3r - 2)$

4) $4(6e - 3)$

5) $9(2g - 1)$

6) $4(5d - 1)$

7) $5(4r - 8)$

8) $2(2j - 7)$

9) $6(2u - 8)$

10) $5(2e - 1)$

11) $2(7 - 8r)$

12) $4(1 - 2w)$

13) $6(4 - 2y)$

14) $6(1 - 6r)$

15) $9(1 - 3e)$

16) $10(9 - 2q)$

17) $8(4 - 2p)$

Exercise 5

1) $3(2w + 2) - 2$

2) $5(2f + 3) + 4$

3) $6(2e - 1) + 3$

4) $5(2t - 1) - 3$

5) $3(1 + 3y) + 6$

6) $7(5 + 3w) - 2$

7) $3(2q + 3) + q$

8) $5(5e - 1) + e$

9) $2(3e + 4) - e$

10) $7(4u - 1) - 2u$

11) $3(5 - h) + 2h$

12) $5(3 + 6t) - 4t$

13) $5 + 3(c + 1)$

14) $4 + 5(r + 3)$

15) $6 + 4(g - 5)$

16) $e + 4(e + 2)$

17) $2j + 2(j - 1)$

18) $3y + 6(8 + y)$

Algebra Booklet

Basic Equations

1. Solve

a) $x + 6 = 8$

b) $x + 3 = 12$

c) $x + 7 = 9$

d) $x + 1 = 10$

e) $x + 5 = 8$

f) $x + 1 = 9$

g) $x + 3 = 10$

h) $x + 2 = 2$

i) $x + 3 = 6$

j) $x + 8 = 11$

k) $x + 8 = 14$

l) $y + 9 = 10$

m) $3 + x = 4$

n) $5 + x = 7$

o) $8 = x + 7$

p) $10 = 3 + x$

2. Solve

a) $x - 8 = 1$

b) $x - 1 = 9$

c) $x - 6 = 1$

d) $x - 2 = 4$

e) $y - 1 = 4$

f) $y - 3 = 1$

g) $n - 2 = 1$

h) $x - 8 = 0$

i) $c - 3 = 6$

j) $d - 5 = 10$

k) $b - 1 = 12$

l) $x - \frac{1}{2} = 5$

m) $x - 3 = 14$

n) $x - 5 = 0$

o) $6 = x - 8$

p) $9 = x - 2$

3. Solve

a) $x + 7 = 14$

b) $x - 5 = 3$

c) $a + 1 = 10$

d) $y - 2 = 7$

e) $n - 6 = 20$

f) $t - 4 = 16$

g) $g - 3 = 7$

h) $m + 2 = 13$

i) $y + 9 = 11$

k) $w + 1 = 17$

l) $x - 6 = 6$

m) $4 + k = 8$

m) $12 = x + 1$

n) $2 = x - 10$

o) $9 = 5 + x$

p) $x - \frac{1}{2} = 4$

4. Solve

a) $2x = 10$

b) $4x = 20$

c) $2x = 18$

d) $3x = 12$

e) $7x = 14$

f) $3x = 33$

g) $8x = 56$

h) $9x = 54$

i) $5x = 75$

j) $4x = 24$

k) $9x = 81$

l) $12x = 108$

5. Solve

a) $2x + 4 = 10$

b) $2x + 8 = 13$

c) $3x + 1 = 10$

d) $4x + 3 = 19$

e) $10x + 7 = 57$ f) $2x + 3 = 10$ g) $7x + 4 = 25$ h) $2x - 4 = 8$
 i) $3x - 5 = 4$ j) $2x - 2 = 8$ k) $8x - 7 = 57$ l) $7x - 1 = 20$
 m) $23 = 4x + 7$ n) $7 = 2x + 1$ o) $20 = 3x - 7$ p) $2x - 3 = 2$

6. Solve

a) $8 - x = 2$ b) $10 - x = 7$ c) $15 - 2x = 9$ d) $25 - 3x = 25$
 e) $18 - 2x = 8$ f) $17 + 3x = 26$ g) $40 - 3x = 1$ h) $41 = 12 + 29x$
 i) $15 = 4x - 1$ j) $20 = 14 + 3n$ k) $18 = 5m + 3$ l) $91 - 7h = 0$

Equations with unknowns on both sides

1. Solve

a) $2x = x + 6$ b) $2y = y + 3$ c) $3a = a + 8$ d) $4x = x + 9$
 e) $3m = m + 2$ f) $4n = n + 9$ g) $5k = k + 16$ h) $6p = p + 5$
 i) $2t = t + 7$ j) $4x = 2x + 18$ k) $3x = x + 12$ l) $5y = 30 + 2y$

2. Solve

a) $3x = 8 - x$ b) $4y = 15 - y$ c) $5t = 12 - t$ d) $6u = 21 - u$
 e) $2s = 9 - s$ f) $3t = 12 - t$ g) $5u = 6 - u$ h) $2v = 18 - v$
 i) $3t = 20 - t$ j) $7t = 80 - 3t$ k) $6x = 18 - 3x$ l) $3x = 25 - 2x$

3. Solve

a) $4x + 5 = 3x + 8$ b) $8x + 4 = 7x + 6$ c) $5x + 3 = 4x + 7$
 d) $3x + 1 = 2x + 10$ e) $7x + 3 = 5x + 9$ f) $10x + 4 = 8x + 8$
 g) $12x + 7 = 2x + 27$ h) $14x + 6 = 7x + 13$ i) $9x + 4 = x + 28$

4. Solve

a) $4x - 5 = 3x + 1$ b) $6x - 2 = 5x + 4$ c) $9x - 1 = 7x + 7$

d) $6x - 7 = x + 3$ e) $5x - 3 = x + 5$ f) $9x - 3 = 5x + 7$

g) $7x - 2 = 3x + 18$ h) $9x - 3 = 4x + 7$ i) $14x - 16 = 4x + 24$

5. Solve

a) $5x - 6 = 3x$ b) $7x - 10 = 2x$ c) $23x - 15 = 13x + 30$

d) $4c - 15 = c$ e) $6p = 14 - p$ f) $7y = 25 - 5y$

g) $4x - 1 = 3x + 1$ h) $8k - 2 = 6k + 10$ i) $3m - 1 = 7 - m$

6. Simplify both sides of these equations and solve them

a) $x + x = 18$ b) $2y + y = 24$ c) $3x + x + 5 = 21$

d) $6x - 2x = 48$ e) $7y - 3y + 5 = 25$ f) $7p + 3 - p = 33$

g) $6x + 4 + 2x + 1 = 21$ h) $2x + 7 + 3x + 3 = 30$

i) $8x + 2 - 4x + 5 = 15$ k) $7x + 6 - 5x + 2 = 12$

l) $12x + 8 - 6x - 5 = 33$ m) $9x + 9 - 6x - 6 = 54$

n) $2x + 2x + 5 = 2x + x + 8$ o) $5x + 7x + 7 = x + x + 27$

p) $8x - 2x - 2 = 3x + 2x + 4$ q) $4x + 2x - 1 = x + 29$

r) $8x + 3 + 4x + 5 = 5x + 9 + 5x + 11$

s) $7x + 2 + 3x + 9 = 4x + 12 + 3x + 8$

t) $3x + 9x + 7 + 4 = 6x + 17 + 14 + x$

u) $9x - 5x + 8 - 3 = 7x + 13 - 5x - 2$

Forming Equations

1. For each of the following statements write down an equation and solve it
 - a) When x is doubled and 9 added, the result is 27.
 - b) When x is multiplied by 6 and then 3 is added, the result is 24
 - c) A square has side of length $(x + 2)$ cm. Its perimeter is 32 cm.

2. I have x pence. John has 20 pence more than me. Ian has twice as much as I have. Altogether we have 80 pence.
 - a. How much (in terms of x) have John and Ian?
 - b. Write down an equation for x and solve it
 - c. How much money do John and Ian have?

4. Alan is y years old. His elder brother is 6 years older than him and his younger brother is eight years younger. If all their ages add up to 37 years find out how old Alan is.

Algebra Challenges.

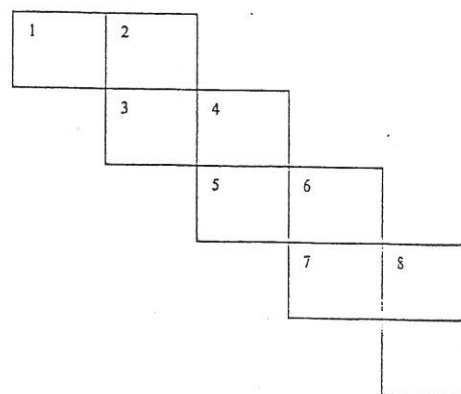
1. Copy and complete this cross number puzzle. Solve the equations to find the entries in the puzzle.

ACROSS

1. $2x = 24$
3. $2x + 2 = x + 16$
5. $2x - 1 = x + 31$
7. $3x = x + 102$

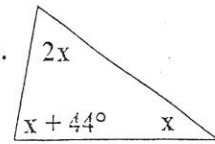
DOWN

2. $x + 9 = 30$
4. $2x + 3 = x + 46$
6. $2x - 1 = 49$
8. $3x + 5 = x + 25$

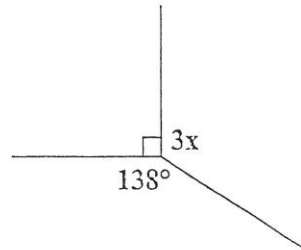
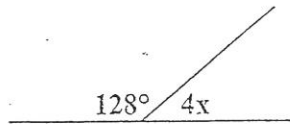


Making equations and solving them -
Mixture of examples (first year)

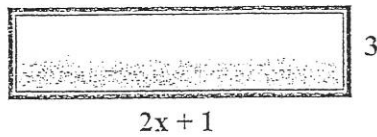
1. Make an equation and solve it to find all the angles.



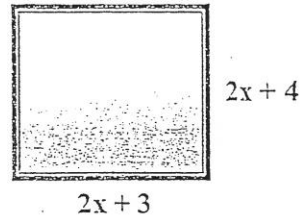
2. In each diagram make an equation and solve it to find x.



- 3.



Perimeter = 43cm

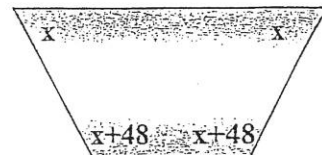


Perimeter = 35cm

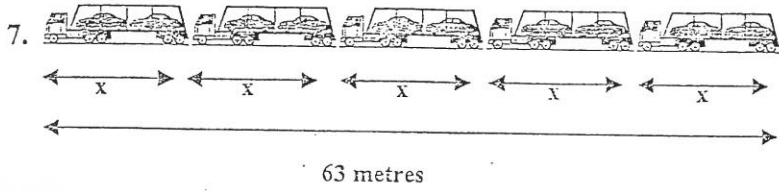
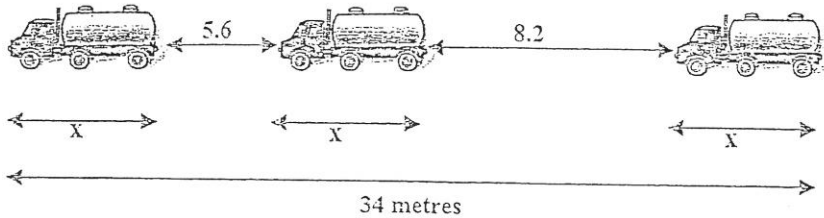
In each diagram make an equation and find x.

4. The angles in a triangle are x , $x + 40$ and $2x$. Make an equation and find all the angles.

5. Make an equation and solve it to find all the angles in the quadrilateral shown.



6. Make an equation and solve it to find the length of a tanker.



Make an equation and find the length of a carrier.

8. Robert, Peter and George are triplets. David is 7 years older than the triplets and Alan is twice as old as David. If the sum of all the ages is 81 years, make an equation and find the ages of all the members of the family.



9. George and Jim are twins. Mary and Helen are another set of twins 9 years older than the first set of twins. The sum of all their ages is 66 years. Make an equation and find the ages of each pair of twins.

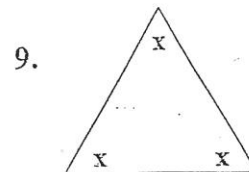
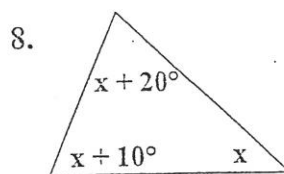
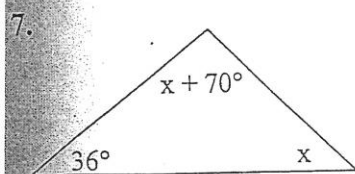
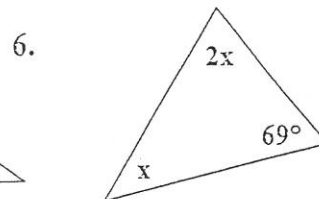
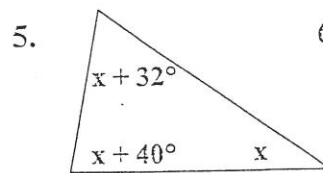
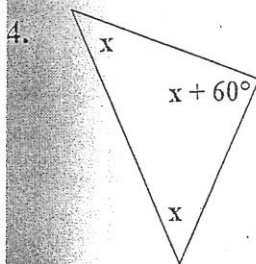
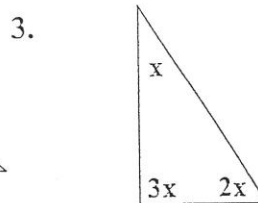
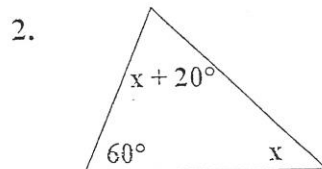
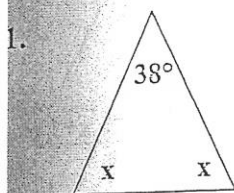
10. When a number is divided by six and 7 is added, the result is 18. Make an equation and solve it to find the number.

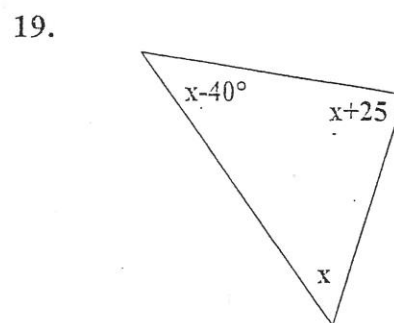
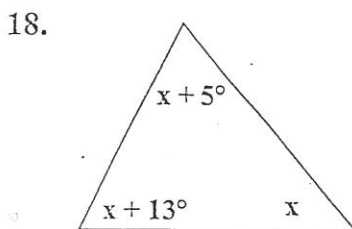
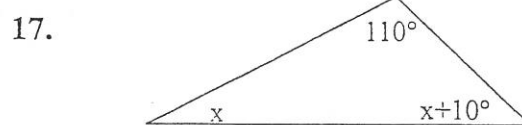
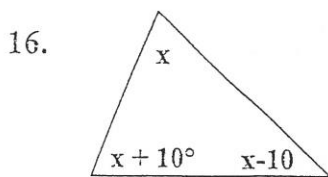
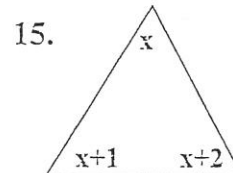
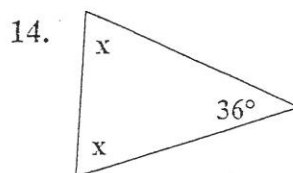
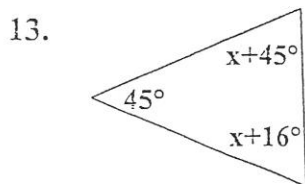
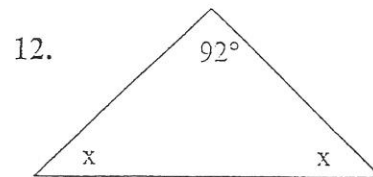
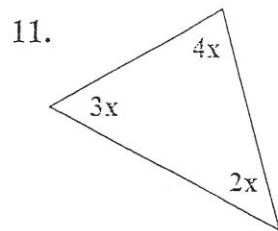
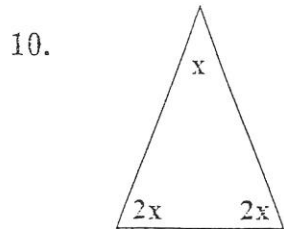
11. A number is doubled and then 13 is subtracted from it. The result is 35. Make an equation and find the starting number?

Making Equations

Fact:- The angles in a triangle add up to 180°


In each of the triangles below, make an equation and then solve that equation to find x . Hence find the sizes of all the angles in each triangle.








Making Equations:- The perimeter of a rectangle.

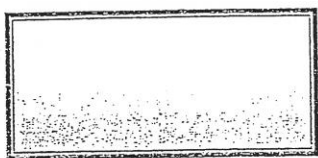
In each of the examples below, the perimeter of the rectangle is given. Make an equation and solve it to find x . Hence state the lengths of the sides of the rectangles.


1.  $x + 7$
Perimeter = 33cm


2.  $2x + 1$
Perimeter = 26cm


3.  $x + 5$
Perimeter = 31cm

4.  $3x + 2$
Perimeter = 23cm

5.  $3x + 2$
Perimeter = 34cm

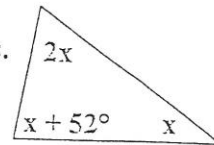
6.  $x + 3$
Perimeter = 43cm

7.  $2x + 3$
Perimeter = 29cm

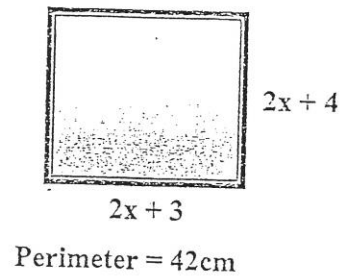
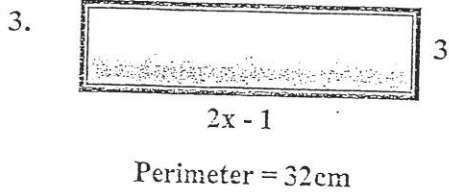
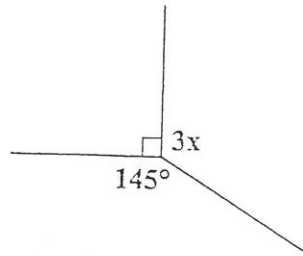
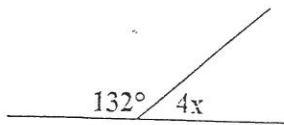
8.  $x + 7$
Perimeter = 28cm

Making equations and solving them -
Mixture of examples

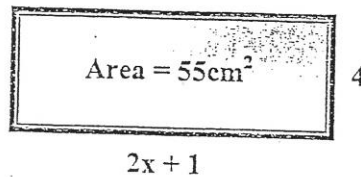
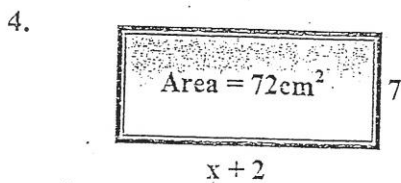
1. Make an equation and solve it to find all the angles.



2. In each diagram make an equation and solve it to find x .

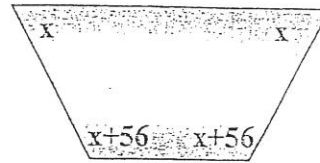


In each diagram make an equation and find x .

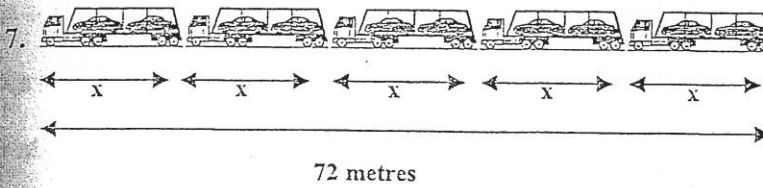
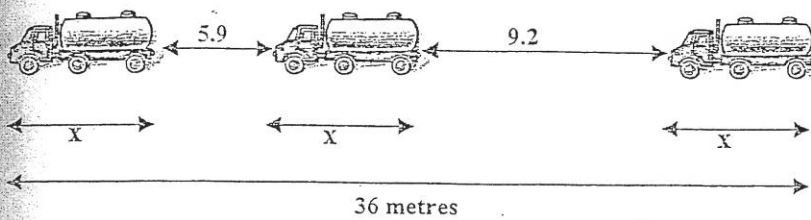


In the diagrams above, the area is given. Make an equation and solve it to find x .

5. Make an equation and solve it to find all the angles in the quadrilateral shown.



6. Make an equation and solve it to find the length of a tanker.



Make an equation and find the length of a carrier.

8. Robert, Peter and George are triplets. David is 9 years older than the triplets and Alan is twice as old as David. If the sum of all the ages is 159 years, make an equation and find the ages of all the members of the family.



9. George and Jim are twins. Mary and Helen are another set of twins 6 years older than the first set of twins. The sum of all their ages is 84 years. Make an equation and find the ages of each pair of twins.

Substitution (2)

Exercise 1.

If $a = 4$, and $b = 9$, evaluate each of the following :-

- | | | | | |
|----------------|----------------|---------------|----------------|-----------------|
| 1) $-8a + 10b$ | 2) $-6a + 4b$ | 3) $-7a + 9b$ | 4) $-7a - b$ | 5) $6a - b$ |
| 6) $-5a - 7b$ | 7) $-3a - 2b$ | 8) $8a + 5b$ | 9) $-6a + 8b$ | 10) $6a + b$ |
| 11) $8a + 3b$ | 12) $-8a + 5b$ | 13) $2a - 7b$ | 14) $-8a - 6b$ | 15) $-7a - 10b$ |
| 16) $3a + 8b$ | 17) $-4a + 2b$ | 18) $6a - 8b$ | 19) $3a + 2b$ | 20) $5a - 5b$ |

Exercise 2.

If $a = -3$, and $b = 10$, evaluate each of the following :-

- | | | | | |
|----------------|----------------|----------------|----------------|----------------|
| 1) $6a + 4b$ | 2) $-5a - 9b$ | 3) $-8a + 8b$ | 4) $4a - 7b$ | 5) $7a + 4b$ |
| 6) $-2a - 10b$ | 7) $3a + 8b$ | 8) $-8a + 10b$ | 9) $-2a + 1b$ | 10) $-a - 7b$ |
| 11) $6a - 3b$ | 12) $2a - 4b$ | 13) $7a + 9b$ | 14) $2a + 6b$ | 15) $-2a + 8b$ |
| 16) $3a + 9b$ | 17) $-6a - 6b$ | 18) $6a + 3b$ | 19) $-8a + 6b$ | 20) $a - 3b$ |

Exercise 3.

If $a = 5$, and $b = -3$, evaluate each of the following :-

- | | | | | |
|----------------|----------------|----------------|----------------|----------------|
| 1) $-8a + 8b$ | 2) $-3a - 6b$ | 3) $8a + 4b$ | 4) $5a + 10b$ | 5) $4a - 5b$ |
| 6) $-8a + 10b$ | 7) $-3a - 4b$ | 8) $-3a - 4b$ | 9) $-2a + 2b$ | 10) $7a - 5b$ |
| 11) $-7a - 9b$ | 12) $-5a - b$ | 13) $7a + 5b$ | 14) $-6a + 7b$ | 15) $-7a - 5b$ |
| 16) $6a - 7b$ | 17) $-3a + 2b$ | 18) $-4a + 4b$ | 19) $5a + 2b$ | 20) $5a - 2b$ |

SIMPLIFYINGANSWERSEx 1. Pg 1

- 1) $8x$ 2) $4y$ 3) $9t$ 4) $8m$ 5) $18p$ 6) $13z$
 7) $10y$ 8) $5c$ 9) $17x$ 10) $8t$ 11) $13e$ 12) $16p$.

Ex 2.

- 1) $12x$ 2) $4r$ 3) $9m$ 4) $12b$ 5) $12t$ 6) $8c$
 7) $5f$ 8) $9a$ 9) $10z$ 10) $5m$ 11) $7t$ 12) $7g$

Ex 3. Pg 2

- 1) $10y + 5t$ 2) $4h + 6r$ 3) $5u + 8$ 4) $6e + 3r$ 5) $2k + 4r$
 6) $8r$ 7) $2e + 6w$ 8) $2q + 5$ 9) $6g + h$ 10) $2x$
 11) 0 12) $13f - 3q$ 13) $-3h + 2e$

Ex 4

- 1) $12x + 2y$ 2) $3m + 8n$ 3) $7k + 5$ 4) $11t + 2p$ 5) $v + 2u$
 6) $1m + n$ 7) $6p + 10q$ 8) x 9) $e + f$ 10) $9x + 3$
 11) $4y + 1$ 12) $5y + 2m$ 13) $3t + 5w$.

MORE SIMPLIFYINGEx 1. Pg 3

- 1) $16p$ 2) p^3 3) mn 4) $15t$ 5) d^2 6) p^3
 7) $8y$ 8) $6m$ 9) y^2 10) $12y$ 11) $3m^2$ 12) $16k^2$

Ex 2

- 1) $10x$ 2) $6e^2$ 3) $15pq$ 4) $12t$ 5) $9t^2$
 6) $20q^2$ 7) $3b^2$ 8) $5m^2$ 9) $10h^2$ 10) $6t^2$
 11) $30a^2$ 12) $60n$.

Ex 3.

- 1) $35u^3$ 2) $27v^2$ 3) $100h^2$ 4) $36j^3$ 5) $12y^3$ 6) $5q^3$
7) $12f^3$ 8) $24xy^2$ 9) $24j^3$ 10) $6h^2t$ 11) $4w^2$ 12) $27x^3$

Ex 4. Pg 4

- 1) $4a$ 2) $8b$ 3) $2g$ 4) $9k$ 5) $12h$ 6) $14d$ 7) $24u$
8) $10ab$ 9) $24pq$ 10) a^2 11) w^3 12) $18a^2$ 13) $4pqr$
14) $10uv$ 15) $4s^2t$ 16) $6a^2$ 17) b^2c 18) $6ab$ 19) m^2
20) $6f^2$ 21) $8w^2$ 22) f^3 23) $14f^3$ 24) $12f^3$ 25) $120u$

Ex 5.

- 1) $5a$ 2) $12b$ 3) $4b+4h$ 4) $4w$ 5) m 6) $9p$
7) $10u$ 8) $3v$ 9) $3m$ 10) $12f$

Ex 6.

- 1) F 2) T 3) T 4) F 5) T 6) F 7) F
8) F 9) T 10) T

EXPAND & SIMPLIFY Pg 5

- 1) $3d+6$ 2) $4g+16$ 3) $2m+2$ 4) $6u+36$
5) $7m+14$ 6) $12+4y$ 7) $20+5u$ 8) $20+2h$
9) $24+3j$ 10) $12+4e$

Ex 2

- 1) $3w-3$ 2) $4u-12$ 3) $6r-6$ 4) $7p-21$ 5) $4e-40$
6) $4s-4q$ 7) $5-5u$ 8) $35-7t$ 9) $16-8g$ 10) $40-8k$

- $1) 21e + 7$
 $2) 16w + 4$
 $3) 10r + 25$
 $4) 35e + 21$
 $5) 14d + 7$
 $6) 36r + 72$
 $7) 15t + 21$
 $8) 9e + 24$
 $9) 4 + 10r$
 $10) 28 + 12w$
 $11) 24 + 12y$
 $12) 6 + 36r$
 $13) 40 + 30q$
 $14) 20 + 15u$

<4 Pqk

- $1) 13e - 12$
 $2) 10r - 3$
 $3) 21r - 14$
 $4) 24e - 12$
 $5) 20d - 4$
 $6) 20r - 40$
 $7) 4j - 14$
 $8) 12u - 48$
 $9) 14 - 16r$
 $10) 4 - 8w$
 $11) 24 - 12y$
 $12) 6 - 36r$
 $13) 90 - 20q$
 $14) 32 - 16p$

<5

- $1) 6w + 6 - 2$
 $2) 10f + 15 + 4$
 $3) 12e - 6 + 3$
 $4) 10t - 5 - 3$
 $= 6w + 4$
 $= 10f + 19$
 $= 12e - 3$
 $= 10t - 8$
 $5) 35 + 21w - 2$
 $6) 6q + 9 + q$
 $7) 25e - 5 + e$
 $8) 6e + 8 - e$
 $21 - 33$
 $7q + 9$
 $26e - 5$
 $5e + 8$
 $9) 15 - 3h + 2h$
 $10) 15 + 30t - 4t$
 $11) 5 + 3c + 3$
 $12) 4 + 5r + 15$
 $15 - h$
 $15 + 26t$
 $3c + 8$
 $5r + 19$
 $13) e + 4e + 8$
 $14) 2j + 2j - 2$
 $15) 3y + 48 + 6y$
 $5e + 8$
 $4j - 2$
 $9y + 48$

BASIC EQUATIONS PG 7

a) $x=2$ b) $x=9$ c) $x=2$ d) $x=9$ e) $x=3$

f) $x=8$ g) $x=7$ h) $x=0$ i) $x=3$ j) $x=3$

k) $x=6$ l) $y=1$ m) $x=1$ n) $x=2$ o) $x=1$

p) $x=7$

s) $x=9$ b) $x=10$ c) $x=7$ d) $x=6$ e) $y=5$

f) $y=4$ g) $n=3$ h) $x=8$ i) $c=9$ j) $d=15$

k) $b=13$ l) $x=5\frac{1}{2}$ m) $x=17$ n) $x=5$ o) $x=14$

p) $x=11$

s) $x=21$ b) $x=8$ c) $a=9$ d) $y=9$ e) $n=26$

f) $t=20$ g) $g=10$ h) $m=15$ i) $y=12$ j) $w=8$

k) $x=12$ m) $k=4$ n) $x=11$ n) $x=12$ o) $x=4$

p) $x=4\frac{1}{2}$

t) $x=5$ b) $x=5$ d) $x=9$ d) $x=4$ e) $x=2$

f) $x=11$ g) $x=7$ h) $x=6$ i) $x=15$ j) $x=6$

k) $x=9$ l) $x=9$

s) $x=3$ b) $x=\frac{5}{2}$ c) $x=3$ d) $x=4$ e) $x=$

f) $x=\frac{7}{2}$ g) $x=3$ h) $x=6$ i) $x=3$ j) $x=$

k) $x=8$ l) $x=3$ m) $x=4$ n) $x=3$ o) $x=$

n) $x=\frac{5}{2}$

g) $x=6$ b) $x=3$ c) $x=3$ d) $x=0$ pg 8
 e) $x=5$ f) $x=3$ g) $x=13$ h) $x=1$.
 i) $x=4$ j) $n=2$ k) $m=3$ l) $n=13$.

KNOWNS ON BOTH SIDES pg 8

$x=6$ b) $y=3$ c) $a=4$ d) $x=3$ e) $m=1$
 $n=3$ g) $k=4$ h) $p=1$ i) $t=7$ j) $x=9$
 $x=6$ l) $y=10$.

$x=2$ b) $y=3$ c) $t=2$ d) $u=3$ e) $s=3$
) $t=3$ g) $u=1$ h) $v=6$ i) $t=5$ j) $t=8$
) $x=2$ l) $x=5$.

$x=3$ b) $x=2$ c) $x=4$ d) $x=9$ e) $x=3$.
 $x=2$ g) $x=5$ h) $x=1$ i) $x=3$

$\frac{1}{2}$
 $=6$ b) $x=6$ c) $x=4$ d) $x=2$ e) $x=2$

$x = \frac{10}{4}$ g) $x=5$ h) $x=2$ i) $x=4$.

$=3$ b) $x=2$ c) $x=4.5$ d) $c=5$ e) $p=2$

$y = \frac{25}{12}$ g) $x=2$ h) $k=6$ i) $m=2$

b) a) $2x = 18$
 $x = 9$

b) $5y = 24$
 $y = 8$

c) $4x + 5 = 20$
 $x = 4$

a) $4x = 48$
 $x = 12$

e) $4y + 5 = 25$
 $y = 5$

f) $6p + 3 = 33$
 $p = \frac{30}{6}$

g) $8x + 5 = 21$
 $8x = 16$
 $x = 2$

h) $5x + 10 = 30$
 $x = 4$

i) $4x + 7 = 15$
 $x = 2$

j) $2x + 8 = 12$
 $x = 2$

l) $6x + 3 = 33$
 $x = 5$

m) $3x + 3 = 54$
 $x = 17$

n) $4x + 5 = 3x + 8$
 $x = 3$

o) $12x + 7 = 2x + 27$
 $x = 2$

p) $6x - 2 = 5x + 4$
 $x = 6$

q) $6x - 1 = x + 29$
 $x = 5$

r) $12x + 8 = 10x + 20$
 $x = 14$

s) $10x + 11 = 7x + 20$
 $x = 7$

t) $12x + 11 = 7x + 31$
 $x = 4$

u) $4x + 5 = 2x + 11$
 $x = 3$

FORMING EQUATIONS Pg 10

1) a) $2x + 9 = 27$
 $x = 9$

b) $6x + 3 = 24$
 $x = \frac{21}{6}$
 $= \frac{7}{2}$

c) $4(x + 2) = 32$
 $4x + 8 = 32$
 $x = 6$

2) me : x
 John : $x + 20$
 Ian : $2x$

b) $x + x + 20 + 2x = 80$
 $4x + 20 = 80$
 $4x = 60$
 $x = 15$

John : $15 + 20$
 $= 35$ p

Ian : 30 p

4) Alan : y
 Brother : $y + 6$
 Younger : $y - 8$

$y + y + 6 + y - 8 = 37$
 $3y - 2 = 37$
 $3y = 39$
 $y = 13$

Alan is 13 year old

Solutions

Algebra Worksheets

Solutions

1 71°

Q2

50°

Q3

30°

2 100°

Q5

96°

Q6

97°

3 127°

Q8

110°

Q9

60°

pg 13.

Equations and solving them

Solutions

1 79°

Q2 $58^\circ, 44^\circ$

Q3

$8.75\text{cm}, 2.625\text{cm}$

4 80°

Q5

66°

Q6

6.73m

7 12.6m

Q8

10 years old
17 years old
34 years old

Q9

12 and 21 yrs

10 66

Q11

24

pg 11 & 12

10. ~~x~~

$$2x + 2x + x = 180$$

$$5x = 180$$

$$\underline{x = 36^\circ}$$

11. ~~9x = 180~~
x = 20°

12. ~~2x + 92 = 180~~

$$2x = 88$$

$$\underline{x = 44}$$

13. $2x + 106 = 180$

$$2x = 74$$

$$\underline{x = 37}$$

14. $2x + 36 = 180$

$$2x = 144$$

$$\underline{x = 72^\circ}$$

15. $3x + 3 = 180$

$$3x = 177$$

$$\underline{x = 59}$$

16. $3x = 180$

$$\underline{x = 60^\circ}$$

17. $2x + 120 = 180$

$$2x = 60$$

$$\underline{x = 30}$$

18. ~~2x~~ $3x + 18 = 180$

$$3x = 162$$

$$\underline{x = 54}$$

19. $3x - 15 = 180$

$$3x = 195$$

$$\underline{x = 65^\circ}$$

$$1. \quad 2x + 14 + 10 = 22$$

$$2x = 9$$

$$x = 4.5$$

$$L = 11.5 \text{ cm}$$

$$3. \quad 2x + 10 + 12 = 31$$

$$2x = 9$$

$$x = 4.5$$

$$L = 9.5 \text{ cm}$$

$$5. \quad 8x + 8 = 34$$

$$8x = 26$$

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

$$L_1 = 9\frac{3}{4} + 2 = 11\frac{3}{4}$$

$$L_2 = 3\frac{1}{4} + 2 = 5\frac{1}{4}$$

$$7. \quad 6x + 18 = 29$$

$$6x = 11$$

$$x = 1\frac{5}{6}$$

$$L_1 = 7\frac{5}{6} + 2 = 9\frac{2}{3}$$

$$4x = 20$$

$$x = 5$$

$$L = 11$$

$$4. \quad 6x + 4 + 8 = 23$$

$$6x = 11$$

$$x = 1\frac{5}{6}$$

$$L = 5\frac{1}{2} + 2$$

$$= 7\frac{1}{2} \text{ cm}$$

$$6. \quad 6x - 4 = 43$$

$$6x = 47$$

$$x = 7\frac{5}{6}$$

$$L_1 = 10\frac{5}{6}$$

$$L_2 = 15\frac{2}{3}$$

$$8. \quad 4x + 16 = 28$$

$$4x = 12$$

$$x = 3$$

$$L_1 = 10$$

$$L_2 = 14$$

$$\begin{aligned}3x + 52 &= 180 \\3x &= 128 \\x &= \underline{42\frac{2}{3}}\end{aligned}$$

$$\begin{aligned}2. \quad 4x + 132 &= 180 \\4x &= 48 \\x &= \underline{12}\end{aligned}$$

$$\begin{aligned}3. \quad 4x + 4 &= 32 \\4x &= 28 \\x &= \underline{7}\end{aligned}$$

$$\begin{aligned}+. \quad 7(x+2) &= 72 \\7x + 14 &= 72 \\7x &= 58 \\x &= \underline{8\frac{2}{7}}\end{aligned}$$

$$\begin{aligned}(b) \quad 3x + 145 + 90 \\3x + 235 \\3x &= \\x &= \underline{1}\end{aligned}$$

$$\begin{aligned}(b) \quad 8x + 14 = 4 \\8x = 2 \\x &= \underline{3}\end{aligned}$$

$$\begin{aligned}(b) \quad 8x + 4 = 5 \\8x = 5 \\x &= \underline{6}\end{aligned}$$

$$\begin{array}{l} \text{Solutions} \\) \quad x + x + x + 56 + x + 56 = 360 \\ \quad 4x + 112 = 360 \\ \quad 4x = 248 \\ \quad x = 62^\circ \end{array}$$

$$\begin{array}{l} b) \quad 3x + 15.1 = 36 \\ \quad 3x = 20.9 \\ \quad x = 6.97 \quad (\text{to d.p.}) \end{array}$$

$$x = 62^\circ$$

$$x + 56 = 118^\circ$$

$$\begin{array}{l}) \quad 5x = 72 \\ \quad x = 14.4 \end{array} \quad \div 5$$

$$\begin{array}{l} 8) \quad R = x \\ \quad P = x \\ \quad G = x \\ \quad D = x + 9 \\ \quad A = 2(x + 9) \end{array}$$

$$\begin{array}{l} x + x + x + x + 9 + 2(x + 9) = 15 \\ 4x + 9 + 2x + 18 = 15 \\ 6x + 27 = 15 \\ 6x = -12 \\ x = -2 \end{array}$$

Triplets 22 years
David 31 years
Alan 62 years

$$\begin{array}{l} G = x \\ J = x \\ M = x + 6 \\ H = x + 6 \\ x + x + x + x + 6 + 6 = 84 \\ 4x + 12 = 84 \\ 4x = 72 \\ x = 18 \end{array} \quad \begin{array}{l} -12 \\ \div 4 \end{array}$$

George & Jim are 18 years

Mary & Helen are 24 years.

$$a = -3$$

$$b = 10 \quad \text{exercice 2} \quad \text{Pg 18.}$$

$$\begin{aligned} 1) & 6a + 4b \\ & -18 + 40 \\ & = 22 \end{aligned}$$

$$\begin{aligned} 2) & -5a - 9b \\ & 15a - 90 \\ & = -75 \end{aligned}$$

$$\begin{aligned} 3) & -8a + 8b \\ & 24 + 80 \\ & = 104 \end{aligned}$$

$$\begin{aligned} 4) & 4a - 7b \\ & -12 - 70 \\ & = -82 \end{aligned}$$

$$\begin{aligned} 5) & 7a + 4b \\ & -21 + 40 \\ & = 19 \end{aligned}$$

$$\begin{aligned} 6) & -2a - 10b \\ & 6 - 100 \\ & = -94 \end{aligned}$$

$$\begin{aligned} 7) & 3a + 8b \\ & -9 + 80 \\ & = 71 \end{aligned}$$

$$\begin{aligned} 8) & -8a + 10b \\ & 24 + 100 \\ & = 124 \end{aligned}$$

$$\begin{aligned} 9) & -2a + b \\ & 6 + 10 \\ & = 16 \end{aligned}$$

$$\begin{aligned} 10) & -a - 7b \\ & 3 - 70 \\ & = -67 \end{aligned}$$

$$\begin{aligned} 11) & 6a - 3b \\ & -18 - 30 \\ & = -48 \end{aligned}$$

$$\begin{aligned} 12) & 2a - 4b \\ & -6 - 40 \\ & = -46 \end{aligned}$$

$$\begin{aligned} 13) & 7a + 9b \\ & -21 + 90 \\ & = 69 \end{aligned}$$

$$\begin{aligned} 14) & 2a + 6b \\ & -6 + 60 \\ & = 54 \end{aligned}$$

$$\begin{aligned} 15) & -2a + 8b \\ & 6 + 80 \\ & = 86 \end{aligned}$$

$$\begin{aligned} 16) & 3a + 9b \\ & -9 + 90 \\ & = 81 \end{aligned}$$

$$\begin{aligned} 17) & -6a - 6b \\ & 18 - 60 \\ & = -42 \end{aligned}$$

$$\begin{aligned} 18) & 6a + 3b \\ & -18 + 30 \\ & = 12 \end{aligned}$$

$$\begin{aligned} 19) & -8a + 6b \\ & 24 + 60 \\ & = 84 \end{aligned}$$

$$\begin{aligned} 20) & a - 3b \\ & -3 - 30 \\ & = -33 \end{aligned}$$

$$a = 5$$

$$1) -8a + 8b$$

$$-40 - 24$$

$$= -64$$

$$b = 3 \quad \text{exercice 3} \quad \text{Pg 18}$$

$$2) -3a - 6b$$

$$-15 + 18$$

$$= 3$$

$$3) 8a + 4b$$

$$40 - 12$$

$$= 28$$

$$4) 20 +$$

$$= 35$$

$$4) 5a + 10b$$

$$25 - 30$$

$$= -5$$

$$6) -8a + 10b$$

$$-40 - 30$$

$$= -70$$

$$7) -3a - 4b$$

$$-15 + 12$$

$$= -3$$

$$8) -3a -$$

$$\text{see 0}$$

$$9) -2a + 2b$$

$$-10 - 6$$

$$= -16$$

$$10) 7a - 5b$$

$$35 + 15$$

$$= 50$$

$$11) -7a - 9b$$

$$-35 + 27$$

$$= -8$$

$$12) -5a$$

$$-25$$

$$= -2$$

$$13) 7a + 5b$$

$$35 - 15$$

$$= 20$$

$$14) -6a + 7b$$

$$-30 - 21$$

$$= -51$$

$$15) -7a - 5b$$

$$-35 + 15$$

$$= -20$$

$$16) 6a$$

$$30$$

$$= 5$$

$$17) -3a + 2b$$

$$-15 - 6$$

$$= -21$$

$$18) -4a + 4b$$

$$-20 - 12$$

$$= -32$$

$$19) 5a + 2b$$

$$25 - 6$$

$$= 19$$

$$20) 5a -$$

$$25$$

$$= 31$$