Mathematics   Date: ………………..
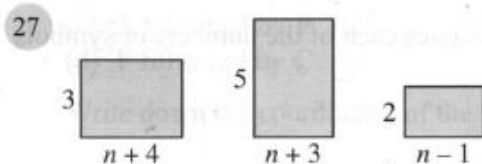
Algebra 4

Exercise A

In questions ① to ⑮ remove the brackets.

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

⑤ $2(2x + 1)$ ⑥ $3(2x + 3)$ ⑦ $4(3x + 1)$ ⑧ $3(4x + 5)$

⑨ $9(2 - x)$ ⑩ $2(4x - 5)$ ⑪ $7(3x - 1)$ ⑫ $10(2x + 5)$

⑬ $5(3x - 5)$ ⑭ $2(3 - 2x)$ ⑮ $3(x + y)$

⑯ Copy and complete.

   (a) $3(2x + \square) = 6x + 21$ (b) $\square(4 - \square) = 12 - 9x$

   (c) $5(\square + \square) = 10x + 30$ (d) $\square(\square - 7) = 8a - 28$

In questions ⑰ to ㉖ remove the brackets and simplify.

⑰ $2(x + 1) + 3(x + 3)$ ⑱ $3(x + 4) + 2(x + 1)$ ⑲ $4(x + 2) + 2(x + 2)$

⑳ $5(x + 1) + 3(x + 2)$ ㉑ $2(4x + 3) + 4(3x + 4)$ ㉒ $3(4x + 5) + 2(x + 5)$

㉓ $5(x + 1) + 3(x - 2)$ ㉔ $6(2x + 1) + 3(1 + 2x)$ ㉕ $4(3x + 1) + (2x - 1)$

㉖ $2(4 + x) + (5x - 2)$

㉗

3 ▢ $n + 4$ 5 ▢ $n + 3$ 2 ▢ $n - 1$

Find an expression for the total area of the three rectangles.
Simplify your answer.

In questions ㉘ to ㊲ remove the brackets and simplify.

㉘ $3(2x + 4) + 2(x + 1)$ ㉙ $5(3 + 2x) + 10x$

㉚ $7(2x - 1) - 4x$ ㉛ $4x + 5(2x + 1) - 7x + 4$

㉜ $6x + 3(2x + 3)$ ㉝ $9 + 3(3x - 1) + 2(4 - x)$

㉞ $5(3x - 1) + 6(2x + 1)$ ㉟ $8(1 + 2x) - 5 + 3(x + 2)$

㊱ $x + 6(3x + 2)$ ㊲ $4(3x - 2) - 10x + 5(x + 2)$

㊳ (a) Write an expression for the area of the picture.

   (b) Write an expression for the perimeter of the picture.

Exercise B

Remove the brackets and simplify

1. $3(n + 2) + (n - 2)$
2. $4(n + 3) - 2(n + 1)$
3. $8(a + 1) - 3(a + 2)$
4. $7(a + 3) - 2(a - 1)$
5. $5(m + 2) - (m + 3)$
6. $6(m + 1) - (m - 2)$
7. $3(a + b) + 5(2a + b)$
8. $3(3a + b) - 2(a + b)$
9. $4(2a + b) - 2(a - b)$
10. $5(a + 3b) - (2a + b)$
11. $5(a - b) - 3(a - 2b)$
12. $4(2a + b) - (3a - b)$

Exercise C

Solve the equations for x.

1. $2(x + 1) = 10$
2. $2(x + 3) = 12$
3. $3(x + 4) = 21$
4. $3(x - 2) = 12$
5. $3(2x + 1) = 9$
6. $4(x - 2) = 8$
7. $5(x + 1) = 5$
8. $2(3x - 1) = 10$
9. $2(3x + 2) = 10$
10. $2(x + 3) = 7$
11. $4(x + 1) = 5$
12. $6(x + 2) = 13$

Questions 13 to 24 involve different unknowns.

13. $5(a + 1) = 20$
14. $3(t - 1) = 18$
15. $4(b + 3) = 20$
16. $3(2y + 3) = 10$
17. $14 = 2(3a + 1)$
18. $16 = 4(n - 2)$
19. $18 = 2(2m + 3)$
20. $5(2x + 2) = 10$
21. $3(2n - 7) = 3$
22. $8(2 + x) = 24$
23. $10(3 + x) = 100$
24. $5(1 + 2x) = 20$

Exercise C

In each question I am thinking of a number. Use the information to form an equation and then solve it to find the number.

1. If we multiply the number by 3 and then add 1, the answer is 25.

2. If we multiply the number by 10 and then subtract 3, the answer is 19.

3. If we multiply the number by 5 and then add 8, the answer is 11.

4. If we multiply the number by 4 and then subtract 3, the answer is 297.

5. If we double the number and add 7, the answer is 20.

6. If we treble the number and subtract 7, the answer is 0.

7. If we double the number and subtract 20, the answer is 9.

In questions 8 to 13 form an equation with brackets

8. If we add 3 to number and then double the result, the answer is 140.

9 If we subtract 5 from the number and then treble the result, the answer is 15.

10 If we add 7 to the number and then multiply the result by 3, the answer is 22.

11 If we subtract 4 from the number and then multiply the result by 5, the answer is 15.

12 If we double the number, add 3 and then multiply the result by 4, the answer is 16.

13 If we double the number, subtract 5 and then multiply the result by 7, the answer is 7.

Exercise D

Solve the equations.

1 $5n = 3n + 10$ 2 $7n = n + 12$ 3 $3n = n + 2$

4 $4n = n + 30$ 5 $4n = n + 15$ 6 $12n = n + 66$

7 $13n = 7n + 24$ 8 $10n = 3n + 21$ 9 $5n = 8 + n$

10 $2n = 7 + n$ 11 $4n + 3 = n + 9$ 12 $7n + 1 = 6n + 8$

13 $3n + 7 = n + 15$ 14 $6n - 1 = 3n + 8$ 15 $5n - 4 = 2n + 5$

16 $1 + 3n = n + 2$ 17 $4n - 11 = 2n + 11$ 18 $1 + 5n = 3n + 13$

19 $6n = 3n + 24$ 20 $5n - 4 = n$

Questions 21 to 30 involve brackets.

21 $3(x + 2) = 2(x + 5)$ 22 $4(x + 1) = 3(x + 3)$ 23 $2(x + 5) = x + 13$

24 $6x - 10 = 2(x + 7)$ 25 $3(x - 1) = 2(x + 6)$ 26 $5(x - 2) = 3(x + 2)$

27 $6(2x + 1) = 10x + 4$ 28 $2(2x - 3) = 3(x + 7)$ 29 $7(2x - 1) = 7$

30 $5(5x + 2) = 2(3x + 5)$

Exercise E

Solve the equations for x.

1 $3(x - 1) = 2x - 2$ 2 $4(x + 2) = 3x + 10$ 3 $2(2x - 1) = x + 4$

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

7 $6 + 3(x + 2) = 2(x + 5) + 4$ 8 $5(x + 1) = 2x + 3 + x$ 9 $4(2x - 2) = 5x - 17$

10 $x + 2(x + 4) = -4$ 11 $3x + 2(x + 1) = 3x + 12$ 12 $4x - 2(x + 4) = x + 1$

Questions 13 to 18 involve different unknowns.

13 $5(2a + 1) - 5 = 3(a + 1)$ 14 $3(4a - 1) - 3 = a + 1$ 15 $2(a - 10) = 4 - 3a$

16 $7(n - 3) = 10 - n$ 17 $3(n + 1) = 2(n + 3) - 6$ 18 $5(2n - 1) = 9(n + 1) - 8$

Exercise F

Solve each problem after forming and then solving an equation.

1 When a number is doubled and then added to 15, the result is 28. Find the number.

2 When a number is added to 9 and the result is multiplied by 7, the answer is 147.
   Find the number.

3 The length of a photo is twice its width.
   The perimeter is 30 cm. Find the width.

4 The length of a rectangle is three times its width.
   If the perimeter is 32 cm, find its width.
   [Hint : Let the width be x.]

5 The length of a rectangle is five times its width.
   If the perimeter is 60 cm, find its width.

6 Form equations to find x.

(a)

(b)
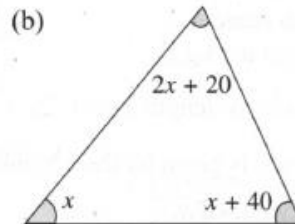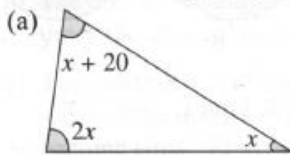
7 If I treble a number, take away 6 and then multiply the result by 2, the answer is 18.
   Find the number.

8 The sum of three consecutive numbers is 63. Let the first number be n and write down the
   other two numbers in terms of n. Find the three numbers.

9 The sum of the three consecutive numbers is 165. Find the three numbers.

10

The rectangle has an area of 27 square units.
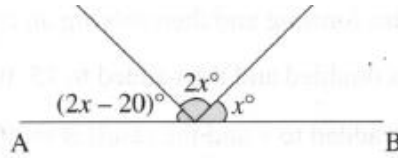
Form an equation and solve it to find x.

11 In the triangle, BC is twice as long as AB.
    AC is 9 cm long.

    If the perimeter is 24 cm, form an equation
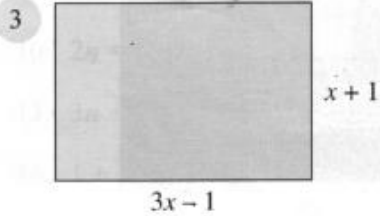   and solve it to find x.
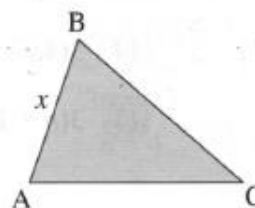
Exercise G

1. If AB is a straight line, form an equation involving x and solve it to find x.

   $(2x - 20)°$ $2x°$ $x°$

   A   B

2. The angles in a triangle are $x°$, $(2x - 10)°$ and $70°$. Find the angles in the triangle.

3. The perimeter of this rectangle is 40 cm. Find x and hence find the area of the rectangle.

   $x + 1$

   $3x - 1$

4. The total mass of three stones A, B and C is 60 kg.
   Stone B is twice as heavy as stone A.
   Stone C is 30 kg heavier than stone A.
   Find the mass of stone A. [Call it x kg.]

   A   B   C
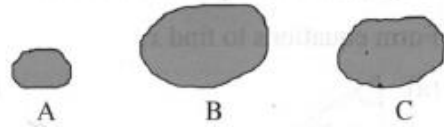
5. An equilateral triangle has sides of length $3x + 1$, $2x + 3$ and $2x + 3$. Find x.

6. The perimeter, P, of a rectangle is given by the formula $P = 2(a + b)$.

   If $P = 19$ and $b = 7$, find the value of a.

7. The volume of a cuboid is given by the formula $V = \ell\, b\, h$.

   If $V = 30$, $\ell = 2$ and $b = 6$, find the value of h.

8. In an arithmagon, the number in a square is the sum of the numbers in the two circles either side of it.

   (a) Explain why the number in circle B is $20 - x$.
   (b) Explain why the number in circle C is $15 - x$.
   (c) Form an equation across the lowest side of the triangle. Solve the equation to find x.

   x 20   15   B   19   C
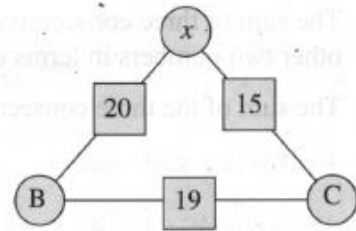
9. Use the method above to find x in these arithmagons.

   (a) x 26   18   22

   (b) x 23   16   21

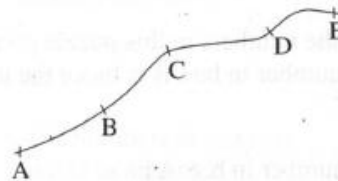   (c) x 35   30   27
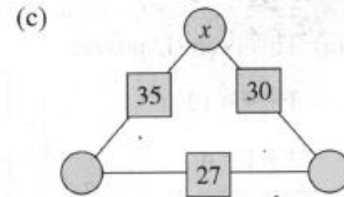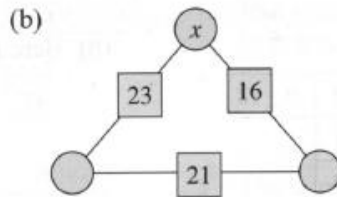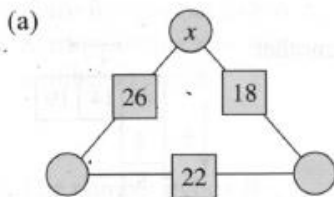
10. The diagram shows a road from A to E.

    A to B is 5 km more than D to E.

   C to D is twice the distance from A to B.

    C is midway between B and D.

    If the total distance from A to E is 91 km, find the distance from D to E.

    E   D   C   B   A

11 The sum of four consecutive whole numbers is 98. Let the first number be x and write down the other three numbers in terms of x. Find the four numbers.

12 The sum of four consecutive *odd* numbers is 216. Find the numbers.

13 The triangle and the rectangle have the same area. Find x.
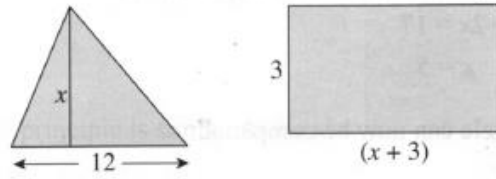
14 (a) The area of rectangle P is five times the area of rectangle Q. Find x.

(b) The value of x is changed and the areas of the unshaded rectangles become equal. Find the new value of x.
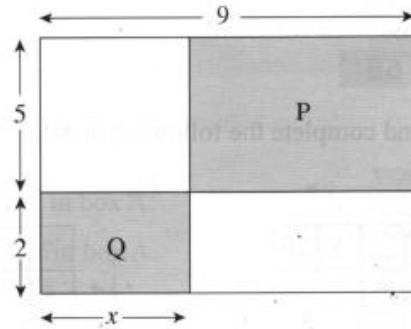
15 My daughter asked how old I am. I answered 'In 20 years, I'll be twice as old as I was 12 years ago.' How old am I?

16 You have three consecutive even numbers so that the sum of twice the smallest number plus three times the middle number is four times the largest number.
Find the three numbers.