Unit 12 Linear equations and inequalities

12.1: Writing Linear equations and inequalities

1. In a school tuck shop, packets of crisps cost g pence and drinks cost h pence.
   If $3g + 5h > 200$, are the following statements true or false?

	True	False
The cost of three packets of crisps and five drinks is more than £2.00		
The cost of three drinks and five packets of crisps is less than £2.00		
£2.00 is less than the cost of three packets of crisps and five drinks.		

2. Tickets to a theme park cost x pounds per adult and y pounds per child.
   What does each equality or inequality represent?
   a) $x + y = 100$

   b) $2x + 3y < 250$

   c) $x - y < 15$

3. In the school shop, pencils cost a pounds, pens cost b pounds and rulers cost c pounds.
Match each situation to the correct equality or inequality.

The cost of five pencils and three pens is less than three pounds.	$5a + 3b > 3$
Three pounds is less than the cost of five pencils and three pens.	$3(5a + 3b) = c$
The cost of five pencils and three pens is three times the cost of a ruler	$5a + 3b < 3$
The cost of five pencils and three pens together is the same as a third of the cost of a ruler.	$5a + 3b = 3c$

4. Andrea buys five puzzle books at w pounds each, and four magazines, at r pounds each.
The total cost is less than £10.
Write an inequality to represent this.

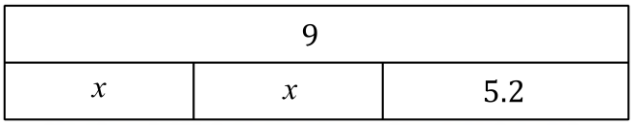
5. When s is subtracted from t, the difference is 9.
Write an equation to represent this.

6. Samuel is t years' old, and his mother is q years old.
Samuel's mother is more than three times Samuel's age.
Write an inequality to represent this.

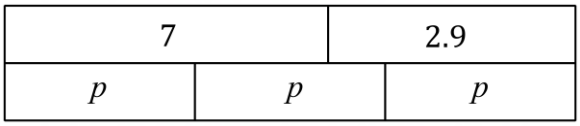
12.2: Solving equations and inequalities with the unknown on only one side

1. Solve each of these equations.

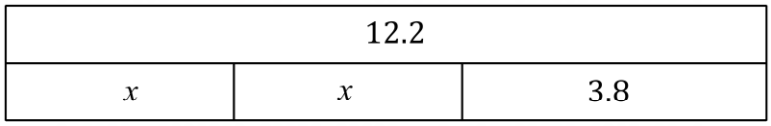
a) $2x + 5.2 = 9$



b) $3p - 2.9 = 7$



c) $12.2 - 2x = 3.8$



2. Solve each of these equations.

a) $8 + 2x = 19$

b) $8 - 2x = 19$

c) $24 = 6 + 5x$

d) $24 = 6 - 5x$

e) $3x + 5 = 24$

f) $63 - 7x = 13$

3. Solve the equations to work out the unknown values.

a) $3(x + 7) = 102$

b) $3(x - 7) = 102$

c) $102 = 3x - 7$

4. Solve the equations.

a) $5(2m+1)+3(4m-2)=99$

b) $5(2m+1)-3(4m-2)=99$

c) $5(2m-1)-3(-4m-2)=99$

5. Solve each of these equations.

a) $11=\frac{s}{4.5}$

b) $8=\frac{t}{3.1}-2$

c) $12=\frac{2}{3}(w-2)$

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

6. Solve these equations and inequalities.

a) $2x - 3 = 12$

b) $2x + 3 < 12$

c) $-2x + 3 < 12$

d) $5x + 3 = 19$

e) $5x + 3 > 19$

f) $-5x - 3 > 19$

g) $24 - 8x = -12$

h) $24 - 8x > -12$

i) $8x - 24 > -12$

j) $34 = 9 - 5x$

k) $34 < 9 + 5x$

l) $34 < 9 - 5x$

m) $17 = 35 - 3x$

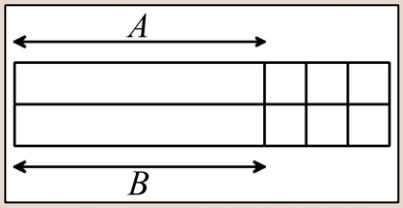
n) $17 > 35 - 3x$

o) $17 > 3x - 35$

Concept corner: Properties of equality

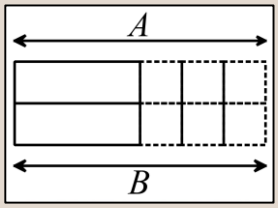
1. If the same expression is added to two equal quantities, then the two resulting expressions will be equal.

   For example, if $A = B$
   then $A + 3 = B + 3$



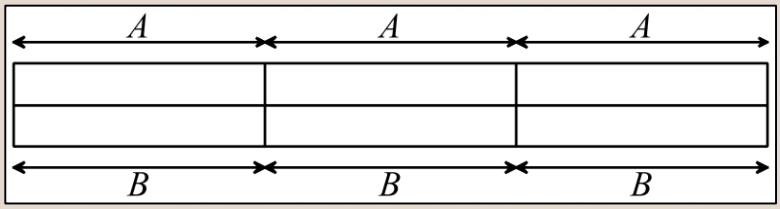
2. If the same expression is subtracted from two equal quantities, then the two resulting expressions will be equal.

   For example, if $A = B$
   then $A - 3 = B - 3$



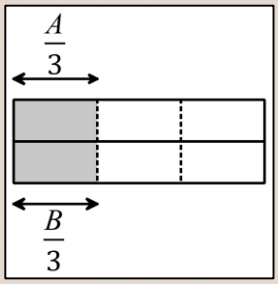
3. If two equal expressions are both multiplied by the same quantity, then the two resulting expressions will be equal.

   For example, if $A = B$
   then $3A = 3B$



4. If two equal expressions are both divided by the same quantity, then the two resulting expressions will be equal.

   For example, if $A = B$
   then $\frac{A}{3} = \frac{B}{3}$



12.3: Solving equations with the unknown on both sides of the equality

1. Solve these equations.
   a) $7x + 5 = 9x$

   b) $3x + 18 = 7x + 7$

   c) $19 - 4x = x + 10$

   d) $7x + 2 = 32 - 3x$

   e) $16x - 11 = 14 - 4x$

2. Solve these equations.
   a) $0.8x + 1.1 = 0.3x + 4.1$

   b) $0.6x + 3.2 = 4.7 + 2.1x$

   c) $23.4 - 3.7x = 1.3x - 1.6$

3. Solve the following equations.
   a) $6(2x - 4) = 5x + 28.5$

   b) $5(3x - 1.5) = 10x + 4$

   c) $6x + 169 = 8(1 - 5x)$

d) $33 - 2x = 3(2x - 19)$

e) $6(x - 1.5) = 7(x - 2.5)$

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

g) $8(8 - 3x) = 7(10 - 6x)$

h) $9(2 - x) = -7(x + 14)$

4. Expand brackets, and gather like terms before solving the equations.
   a) $-5x = 7 + 3(4x + 9)$

b) $4x = 13 - 3(2x - 9)$

c) $8 - 3(4 - 2x) = 5(x - 2)$

d) $10 - 2(5x - 3) = 4(x - 17)$

5. Solve these equations.

a) $\frac{2}{3}x = 10 - \frac{1}{6}$

b) $\frac{18}{x} = 4.5$

c) $4.2 = \frac{9}{x}$

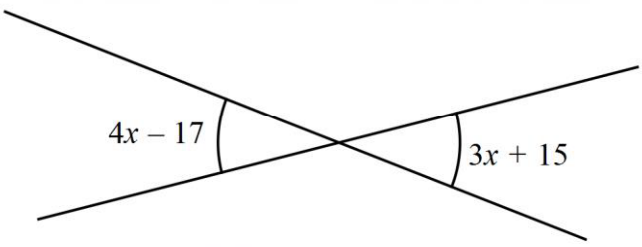
d) $\frac{2}{3}x + \frac{4}{5} = \frac{1}{5} - \frac{1}{3}x$

e) $\frac{5}{9}x - 1 = \frac{1}{3}x - 3$

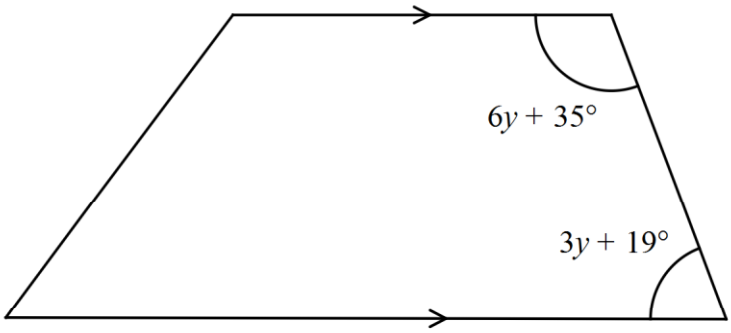
f) $\frac{x+4}{5} = \frac{x+6}{6}$

6. Consider the following diagrams. In each diagram, write and solve an equation to work out the values represented by letters.

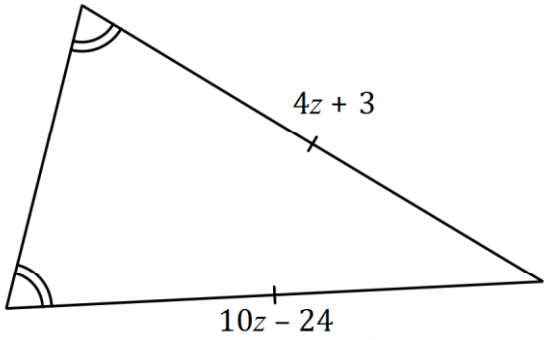
a)



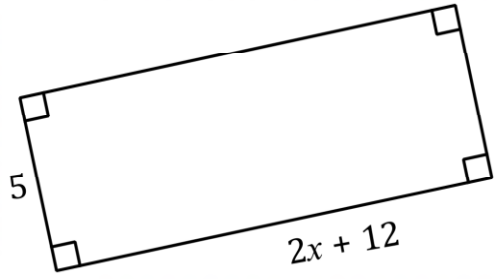
b)

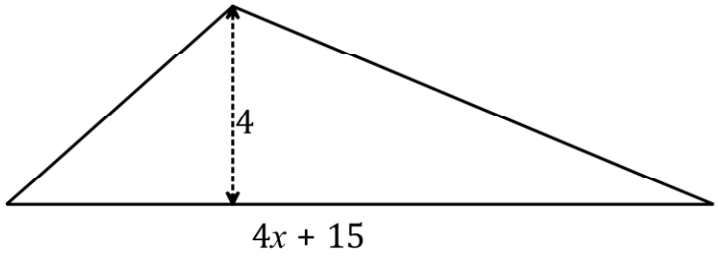


c)



7. The area of the rectangle and the triangle are equal. Work out the value of x.





8. Half of the sum of three consecutive integers, is 7 greater than the first integer.
   What are the three integers?

9. I am thinking of a number, a.
   Four more than my number is four less than twice my number.
   a) Write an inequality in a, to represent this.

   b) Solve the inequality.