

## Substitution - Worksheet

### Skill

#### Group A - Basic expressions

Find the value of each of these expressions when  $x = 5$  and  $y = 8$

1)  $x + 2$

2)  $y - 3$

3)  $4x$

4)  $\frac{y}{2}$

5)  $7x - 6$

6)  $\frac{y}{4} + 9$

7)  $24 - 3x$

8)  $5x + y$

9)  $10y - 3x + 1$

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#### Group B - Expressions with powers and brackets

Find the value of the following expressions when  $a = 3$  and  $b = 9$

1)  $a^2$

2)  $b^2 + 7$

3)  $4a^2 - 5$

4)  $10ab - 8$

5)  $5ab - a^2$

6)  $2a^3 + 3b$

7)  $5(4a - b)$

8)  $6(\sqrt{b} + 2a)$

9)  $\frac{b}{a}(2a^3 - 3\sqrt{b})$

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#### Group C - Substituting negative numbers and decimals

Find the value of the following expressions when  $m = 7$  and  $n = -5$  and  $p = 2.4$

1)  $6n + 3$

2)  $2m - 3n$

3)  $5p + n$

4)  $n^2 + 2p$

5)  $n^2 - 4n + 5$

6)  $mn - 2p + 1$

7)  $3m(2n - 1)$

8)  $(2m^2 + 2)(50 + 2n^2)$

9)  $\frac{np(70-2n^2)}{5}$

## Substitution - Worksheet

### Applied

- 1) A window cleaner uses the following formula to work out how much to charge his customers:

$$C = 20 + 3w$$

where  $C$  is cost in pounds and  $w$  is the number of windows cleaned.

How much does he charge a customer whose house has 8 windows?

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- 2) The following formula can be used to convert between degrees Fahrenheit and degrees Celsius:

$$F = 1.8C + 32$$

Calculate the temperature in degrees Fahrenheit when it is  $-2$  degrees Celsius.

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- 3) The formula

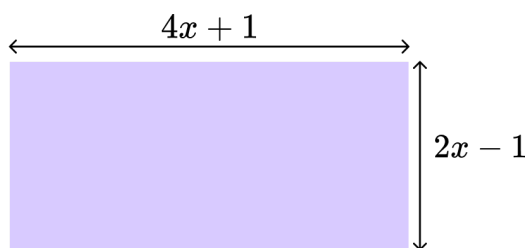
$$s = ut + \frac{1}{2}at^2$$

can be used to calculate the distance ( $s$ ) a vehicle has travelled.

Calculate  $s$  given  $u = 3$ ,  $t = 5$  and  $a = 2$ .

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- 4) Find the area and perimeter of the following shape given  $x = 3.5\text{cm}$ .



## Substitution - Exam Questions

- 1) (a) Work out the value of  $3x + 2y$  when  $x = 6$  and  $y = 4$ .

.....  
(1)

- (b) Work out the value of  $\frac{4a-10b}{5}$  when  $a = 5$  and  $b = -2$ .

.....  
(2)  
(3 marks)

- 
- 2) The cost,  $C$ , of hiring a canoe is given by the formula

$$C = 20 + 2.5h$$

where  $h$  is the number of hours the canoe is to be hired for.

- (a) Calculate the cost of hiring the canoe for 6 hours.

£.....  
(2)

- (b) For how many hours did Lucy hire the canoe if she paid £27.50?

.....  
(2)  
(4 marks)

- 
- 3) Given that  $a = 5$  and  $b = 8$ , state whether each of the following statements are true or false.

Give reasons for your answers.

- (a)  $ab = 58$

.....  
(2)

- (b)  $3a^2 = 75$

.....  
(2)  
(4 marks)

## Substitution - Answers

	Question	Answer
	Skill Questions	
Group A	<p>Find the value of each of these expressions when <math>x = 5</math> and <math>y = 8</math></p> <p>1) <math>x + 2</math></p> <p>2) <math>y - 3</math></p> <p>3) <math>4x</math></p> <p>4) <math>\frac{y}{2}</math></p> <p>5) <math>7x - 6</math></p> <p>6) <math>\frac{y}{4} + 9</math></p> <p>7) <math>24 - 3x</math></p> <p>8) <math>5x + y</math></p> <p>9) <math>10y - 3x + 1</math></p>	<p>1) 7</p> <p>2) 5</p> <p>3) 20</p> <p>4) 4</p> <p>5) 29</p> <p>6) 11</p> <p>7) 9</p> <p>8) 33</p> <p>9) 66</p>
Group B	<p>Find the value of the following expressions when <math>a = 3</math> and <math>b = 9</math></p> <p>1) <math>a^2</math></p> <p>2) <math>b^2 + 7</math></p> <p>3) <math>4a^2 - 5</math></p> <p>4) <math>10ab - 8</math></p> <p>5) <math>5ab - a^2</math></p> <p>6) <math>2a^3 + 3b</math></p> <p>7) <math>5(4a - b)</math></p> <p>8) <math>6(\sqrt{b} + 2a)</math></p> <p>9) <math>\frac{b}{a}(2a^3 - 3\sqrt{b})</math></p>	<p>1) 9</p> <p>2) 88</p> <p>3) 31</p> <p>4) 262</p> <p>5) 126</p> <p>6) 81</p> <p>7) 15</p> <p>8) 54</p> <p>9) 135</p>

## Substitution - Answers

Group C	<p>Find the value of the following expressions when <math>m = 7</math> and <math>n = -5</math> and <math>p = 2.4</math></p> <p>1) <math>6n + 3</math></p> <p>2) <math>2m - 3n</math></p> <p>3) <math>5p + n</math></p> <p>4) <math>n^2 + 2p</math></p> <p>5) <math>n^2 - 4n + 5</math></p> <p>6) <math>mn - 2p + 1</math></p> <p>7) <math>3m(2n - 1)</math></p> <p>8) <math>(2m^2 + 2)(50 + 2n^2)</math></p> <p>9) <math>\frac{np(70-2n^2)}{5}</math></p>	<p>1) <math>-27</math></p> <p>2) <math>29</math></p> <p>3) <math>7</math></p> <p>4) <math>29.8</math></p> <p>5) <math>50</math></p> <p>6) <math>-38.8</math></p> <p>7) <math>-231</math></p> <p>8) <math>10000</math></p> <p>9) <math>-48</math></p>
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## Substitution - Answers

	Question	Answer
	Applied Questions	
1)	<p>A window cleaner uses the following formula to work out how much to charge his customers:</p> $C = 20 + 3w$ <p>where <math>C</math> is cost in pounds and <math>w</math> is the number of windows cleaned.</p> <p>How much does he charge a customer whose house has 8 windows?</p>	£44
2)	<p>The following formula can be used to convert between degrees Fahrenheit and degrees Celsius:</p> $F = 1.8C + 32$ <p>Calculate the temperature in degrees Fahrenheit when it is <math>-2</math> degrees Celsius.</p>	28.4 degrees Fahrenheit
3)	<p>The formula</p> $s = ut + \frac{1}{2}at^2$ <p>can be used to calculate the distance (<math>s</math>) a vehicle has travelled.</p> <p>Calculate <math>s</math> given <math>u = 3</math>, <math>t = 5</math> and <math>a = 2</math>.</p>	40
4)	<p>Find the area and perimeter of the following shape given <math>x = 3.5\text{cm}</math>.</p>	<p>Area = <math>90\text{cm}^2</math></p> <p>Perimeter = <math>42\text{cm}</math></p>

## Substitution - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	Work out the value of $3x + 2y$ when $x = 6$ and $y = 4$ .	(a) $3 \times 6 + 2 \times 4 = 26$	(1)
(b)	Work out the value of $\frac{4a-10b}{5}$ when $a = 5$ and $b = -2$ .	(b) $4 \times 5 = 20$ and $10 \times -2 = -20$ $\frac{20 - -20}{5} = \frac{40}{5} = 8$	(1) (1)
2) (a)	Calculate the cost of hiring the canoe for 6 hours.	(a) $C = 20 + 2.5 \times 6$ $C = 20 + 15$ $C = 35$	(1) (1)
(b)	For how many hours did Lucy hire the canoe if she paid £27.50?	(b) $27.50 = 20 + 2.5h$ $7.50 = 2.5h$ $h = 3$	(1) (1)
3) (a)	$ab = 58$	(a) False $ab$ means $a \times b$	(1) (1)
(b)	$3a^2 = 75$	(b) True $a^2$ is calculated first, then multiply by 3	(1) (1)

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