



EP.M132 Substitution and Formulae in Words

GL ASSESSMENT GL-11PLUS-MATHS · Calculators not allowed · about 55 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** The area A of a rectangle is given by $A = l \times w$. Find the area when $l = 6$ m and $w = 3$ m.

- ☐ A) 9 m^2
☐ B) 18 m^2
☐ C) 24 m^2
☐ D) 36 m^2
☐ E) 63 m^2

(Total for Question 1 is 1 mark)

- 2** The total cost C (in pence) for a group is given by $C = 120 + 35n$, where n is the number of people. What is the cost in pounds for 4 people?

- ☐ A) £2.20
☐ B) £2.60
☐ C) £3.60
☐ D) £1.60
☐ E) £0.60

(Total for Question 2 is 1 mark)

- 3** If $S = 2(x + 3)$ and $x = 4$, what is S ?

- ☐ A) 11
☐ B) 8
☐ C) 14
☐ D) 16
☐ E) 10

(Total for Question 3 is 1 mark)

4 The perimeter P of a square with side s is $P = 4s$. Find P when $s = 7$ cm.

- ☐ A) 14 cm
- ☐ B) 21 cm
- ☐ C) 28 cm
- ☐ D) 49 cm
- ☐ E) 35 cm

(Total for Question 4 is 1 mark)

5 A recipe says the number of scoops, S , needed is $S = 3b - 1$ where b is the number of bowls. How many scoops for $b = 5$?

- ☐ A) 14
- ☐ B) 15
- ☐ C) 10
- ☐ D) 13
- ☐ E) 11

(Total for Question 5 is 1 mark)

6 From the formula $M = 5 + 2n$, where n is the number of items, find M when $n = 0$.

- ☐ A) 0
- ☐ B) 2
- ☐ C) 5
- ☐ D) 7
- ☐ E) 10

(Total for Question 6 is 1 mark)

7 If $T = (x + 2) \times 3$ and $x = 2$, what value of T is obtained?

- ☐ A) 12
- ☐ B) 9
- ☐ C) 10
- ☐ D) 6
- ☐ E) 8

(Total for Question 7 is 1 mark)

- 8** The cooling time in minutes, C , is given by $C = 10 + 2t$ where t is the temperature in degrees above 0. Find C when $t = 6$.

- ☐ A) 12
- ☐ B) 22
- ☐ C) 18
- ☐ D) 20
- ☐ E) 16

(Total for Question 8 is 1 mark)

- 9** A car hire firm charges $H = 25 + 15d$ where d is days hired. What is H for $d = 3$, in pounds?

- ☐ A) £40
- ☐ B) £55
- ☐ C) £70
- ☐ D) £45
- ☐ E) £35

(Total for Question 9 is 1 mark)

- 10** For the formula $F = 4p - (2 + p)$, find F when $p = 3$.

- ☐ A) 6
- ☐ B) 7
- ☐ C) 8
- ☐ D) 5
- ☐ E) 9

(Total for Question 10 is 1 mark)

- 11** If $G = 2(a + b)$ and $a = 3$, $b = 4$, what is G ?

- ☐ A) 10
- ☐ B) 14
- ☐ C) 24
- ☐ D) 7
- ☐ E) 12

(Total for Question 11 is 1 mark)

- 12** The number of tiles T needed is given by $T = (\text{length} + \text{width}) \times 2$. If length = 5 and width = 2, find T .

- ☐ A) 14
☐ B) 15
☐ C) 20
☐ D) 10
☐ E) 12

(Total for Question 12 is 1 mark)

- 13** The function t is defined by $t = 4a - 5$. Calculate t when $a = 3$, then find a when $t = 11$. Give both answers.

(Total for Question 13 is 2 marks)

- 14** A toy's price P in pence is given by $P = 150 - 3x$, where x is the number of stickers used. Find P when $x = 10$ and when $x = 0$. State both answers in pounds.

(Total for Question 14 is 2 marks)

- 15** The distance D in km between two towns is $D = 3m + 2n$ where $m = 4$ and $n = 5$. Calculate D .

(Total for Question 15 is 2 marks)

- 16** Given $Q = 2(x - 1) + 3y$, find Q when $x = 5$ and $y = 2$.

(Total for Question 16 is 2 marks)

- 17** The volume V of a small box is $V = l \times w \times h$. Find V when $l = 2$ cm, $w = 3$ cm and $h = 4$ cm. Then find h when $V = 36 \text{ cm}^3$ and $l = 3$ cm, $w = 3$ cm.

(Total for Question 17 is 2 marks)

- 18** A gardener uses formula $S = (p + q) \times 4$ where p is the number of pots and q is the number of seed trays. If $p = 7$ and $q = 3$, find S . Then find q if $S = 40$ and $p = 5$.

(Total for Question 18 is 2 marks)

- 19** A formula is given by $R = 3(x + 2y) - 5$. Calculate R when $x = 4$ and $y = 3$. Show your working.

(Total for Question 19 is 3 marks)

- 20** The time in minutes, Y , for a recipe is given by $Y = 2(a + 3b) + 4$ where a and b are whole numbers. Find Y when $a = 2$ and $b = 3$. Then if $Y = 48$ and $a = 4$, find b . Show your steps.

(Total for Question 20 is 3 marks)

Mark scheme · EP.M132 Substitution and Formulae in Words

Question 1

- **B1** correct option B (18 m^2) cao
- **Answer: B) 18 m^2 ($6 \times 3 = 18$).**

Question 2

- **B1** correct option B (£2.60) cao
- **Answer: B) £2.60 ($120 + 35 \times 4 = 260$ pence = £2.60).**

Question 3

- **B1** correct option C (14) cao
- **Answer: C) 14 because $2(4 + 3) = 2 \times 7 = 14$.**

Question 4

- **B1** correct option C (28 cm) cao
- **Answer: C) 28 cm ($4 \times 7 = 28$).**

Question 5

- **B1** correct option D (14) cao
- **Answer: D) 14 because $3 \times 5 - 1 = 15 - 1 = 14$.**

Question 6

- **B1** correct option C (5) cao
- **Answer: C) 5 ($5 + 2 \times 0 = 5$).**

Question 7

- **B1** correct option A (12) cao
- **Answer: A) 12 because $(2 + 2) \times 3 = 4 \times 3 = 12$.**

Question 8

- **B1** correct option B (22) cao
- **Answer: B) 22 ($10 + 2 \times 6 = 10 + 12 = 22$).**

Question 9

- **B1** correct option C (£70) cao
- **Answer: C) £70 because $25 + 15 \times 3 = 25 + 45 = 70$.**

Question 10

- **B1** correct option B (7) cao
- **Answer: B) 7 because $F = 4x3 - (2 + 3) = 12 - 5 = 7$.**

Question 11

- **B1** correct option B (14) cao
- **Answer: B) 14 because $2 \times (3 + 4) = 2 \times 7 = 14$.**

Question 12

- **B1** correct option A (14) cao
- **Answer: A) 14 because $(5 + 2) \times 2 = 7 \times 2 = 14$.**

Question 13

- **M1** substitute $a = 3$ to get $t = 4 \times 3 - 5 (= 7)$ seen
- **A1** first answer $t = 7$ and second answer $a = 4$ cao
- **Answer: $t = 7$; when $t = 11$, $11 = 4a - 5$ so $4a = 16$ and $a = 4$.**

Question 14

- **M1** substitutions $P = 150 - 3 \times 10$ and $P = 150 - 3 \times 0$ seen
- **A1** answers £1.20 and £1.50 cao
- **Answer:** When $x = 10$: $P = 150 - 30 = 120$ pence = £1.20. When $x = 0$: $P = 150$ pence = £1.50.

Question 15

- **M1** substitution $3 \times 4 + 2 \times 5 (= 12 + 10)$ seen
- **A1** $D = 22$ km cao
- **Answer:** $D = 3 \times 4 + 2 \times 5 = 12 + 10 = 22$ km.

Question 16

- **M1** substitute $x = 5$ and $y = 2$ to get $2(5 - 1) + 3 \times 2$ seen
- **A1** $Q = 14$ cao
- **Answer:** $Q = 2(5 - 1) + 3 \times 2 = 2 \times 4 + 6 = 8 + 6 = 14$.

Question 17

- **M1** correct substitution for first part and rearrangement for second part seen
- **A1** first answer 24 cm^3 and second answer $h = 4$ cm cao
- **Answer:** First: $V = 2 \times 3 \times 4 = 24 \text{ cm}^3$. Second: $36 = 3 \times 3 \times h$ so $h = 36 / 9 = 4$ cm.

Question 18

- **M1** substitutions and rearrangement seen
- **A1** $S = 40$ and $q = 5$ cao
- **Answer:** First: $S = (7 + 3) \times 4 = 10 \times 4 = 40$. Second: $40 = (5 + q) \times 4$ so $10 = 5 + q$ and $q = 5$.

Question 19

- **M1** substitution $3(4 + 2 \times 3) - 5$ or equivalent seen
- **M1** evaluation inside brackets $4 + 6 = 10$ or $2 \times 3 = 6$ seen
- **A1** $R = 25$ cao
- **Answer:** $R = 3(4 + 2 \times 3) - 5 = 3(4 + 6) - 5 = 3 \times 10 - 5 = 30 - 5 = 25$.

Question 20

- **M1** substitution and bracket expansion seen for first part: $2(2 + 3 \times 3) + 4$ or equivalent
- **M1** calculate first part to get $Y = 26$ or correct intermediate seen
- **A1** second part $b = 6$ cao
- **Answer:** First: $Y = 2(2 + 3 \times 3) + 4 = 2(2 + 9) + 4 = 2 \times 11 + 4 = 22 + 4 = 26$. Second: $48 = 2(4 + 3b) + 4$ so $44 = 2(4 + 3b)$ so $22 = 4 + 3b$ and $3b = 18$ giving $b = 6$.