

Year 7 Mathematics 2016
Algebra and Problem Solving

Total marks: 68

Name *Mark scheme*

1. Using the starting number and the rule given, write the next **two** numbers in each pattern.

a. 40; divide by 2

 20 10 [2]

b. 12; subtract 3

 9 6 [2]

2. For each pattern, write the next number **and the rule** used to find that number.

a. 4, 11, 18, 25,

 32 rule: +7 [2]

b. 3, 6, 12, 24,

 48 rule: ×2 [2]

3. Find the number represented by each pronumeral.

a. $y \times y = 169$

 13 [1]

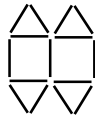
b. $x + 15 = 21$

 6 [1]

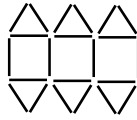
4. Toothpicks have been used to make the following figures.



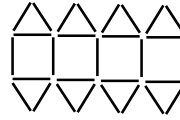
1



2



3



4

a. Complete the table below.

Figure number , n	1	2	3	4
Number of toothpicks, T	8	15	22	29

✓✓ all correct

✓ two correct

[2]

b. Complete the rule that links the number of matches, T , to the figure number, n , in each figure.

$$T = \overset{\checkmark}{7} \times \overset{\checkmark}{n} + \overset{\checkmark}{1}$$

[2]

5. Show the meaning of each expression by including multiplication or division signs and or parentheses.

a. $14y$

$14 \times y$ [1]

b. $3(4x + 2)$

$3 \times (4x + 2)$ [1]

c. $\frac{2x}{5}$

$2x \div 5$ [1]

d. $\frac{8+a}{3}$

$(8 + a) \div 3$ [1]

6. Find the value of each expression if $z = 5$.

a. $2z + 5$

15 [1]

b. $3z^2$

_____ 75 [1]

c. $z(4z - 3)$

_____ 85 [1]

d. $(z + 5)(z - 2)$

$(5 + 5)(5 - 2)✓$

_____ 30✓ [2]

7. If $p = 9$ and $q = 7$, evaluate:

a. $5p - 2q$

$5 \times 9 - 2 \times 7✓$

_____ 31✓ [2]

b. $\frac{p+q}{8}$

$\frac{9+7}{8}✓$

_____ 2✓ [2]

8. Complete the table of values for the formula $n = 20 - 2m$.

<i>m</i>	1	4	5	10
<i>n</i>	18	12	10	0

✓✓ all correct

✓ two correct

[2]

9. How many terms are there in each expression?

a. $7a + 9a$

2 [1]

b. 3

1 [1]

c. $4 + y - y^2 + x + x^2$

5 [1]

10. Simplify each expression by adding or subtracting like terms only.

a. $8b + 3a + 2b$

$10b + 3a$ [1]

b. $10p + 4q + p - 6p$

$5p + 4q$ [1]

c. $10k + 5l - 3m + 4l$

$10k + 9l - 3m$ [1]

d. $7xy + 5yx$

$12xy$ [1]

e. $6e^2 + 9f + 2e^2 - 3f$

$8e^2 + 6f$ [2]

Show your method clearly when solving each of the following problems

Remember to read each question carefully

11. Solve these problems using the trial and error method.

- a. When a positive whole number is squared, the result is 90 more than the original number. Find the original number.

$$x^2 = x + 90 \quad \checkmark \text{ o.e.}$$

\checkmark attempted trials

10 \checkmark [3]

- b. On a farm there are some chickens and some cows. An observer counts 19 heads and 62 feet. Assuming each creature has only one head, cows have 4 feet and chickens have 2 feet, how many chickens and how many cows are on the farm?

$$\checkmark \text{ chickens} + \text{cows} = 19 \text{ and } 2 \times \text{chickens} + 4 \times \text{cows} = 62 \text{ seen}$$

\checkmark attempt to find the solutions to the above

$$\begin{array}{r} \text{Chickens} \quad \text{Cows} \\ 7 + 12 = 19 \\ 7 \times 2 + 4 \times 12 = 62 \end{array}$$

7 chickens 12 cows [3]

12. Solve these problems by first listing the possibilities.

- a. In how many ways can four friends Amy, Beth, Christine and Deb sit in a row if Amy and Christine insist on sitting next to each other?

✓ arrangements with Amy and Christine next to each other seen

✓ 8 or more correct arrangements

12✓

[3]

- b. How many two digit numbers can be made using the digits 5, 6, 7, 8 and 9 at most once each?

✓ attempt to list all possibilities

✓ at least 15 possibilities listed correctly

20✓

[3]

13. Solve these problems by drawing a diagram first.

- a. Sarah has three different coloured tops: red, green and white. She has two different coloured skirts, yellow and pink which she can wear with them. How many different combinations of skirts and tops can she wear?

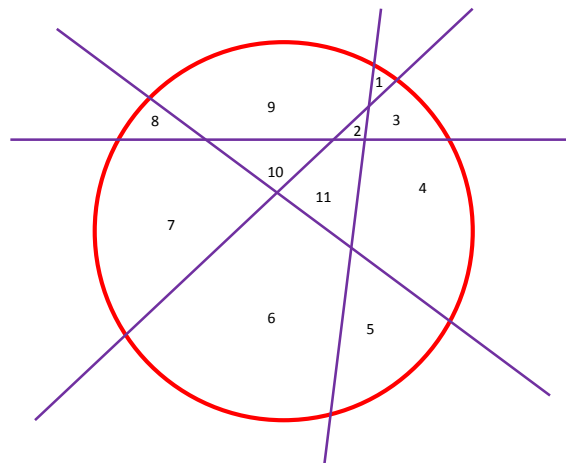
✓✓ use of a tree diagram o.e.

6✓ [3]

- b. What is the largest number of pieces you can cut a round pizza into using four straight cuts?

✓ attempt at dividing up circles o.e.

Cuts	1	2	3	4
Pieces	2	4	7	11



10 pieces✓

11✓✓ [3]

14. Solve these problems using the working backwards method.

- a. The number of rabbits in my rabbit farm doubles each month. At the end of last month there were 24 000 rabbits. How many months ago were there 1500 rabbits?

✓ attempt at halving the number of rabbits

✓ correct working

4 ✓ months ago [3]

- b. Nigel left home at a certain time. He rode his bike for 20 minutes, then walked for a further 15 minutes. He rested for half an hour before continuing on to Sam's house, which was a further 25 minutes walk away. Nigel played at Sam's house for 45 minutes before moving on to his grandmother's home which took him another 20 minutes. He arrived at his grandmother's home, at noon, just in time for lunch. What was the time he left his home that morning?

✓ sum of $20 + 15 + 30 + 25 + 45 + 20 = 155$ minutes seen

✓ attempt to convert sum into hours and minutes or 2 hours 35 min seen

9:25 am ✓ [3]

15. Solve these problems by making a table or looking for a pattern.

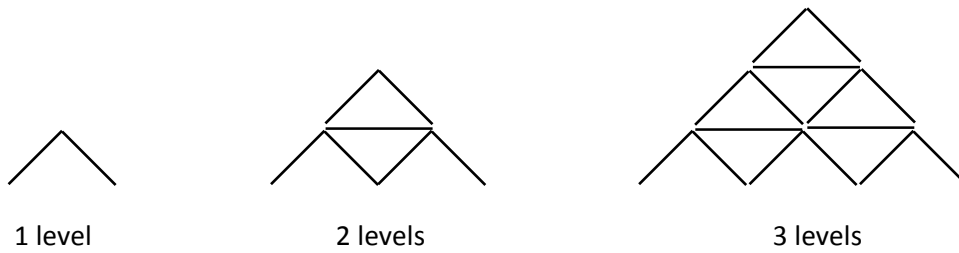
- a. Sergio does weight training once every 5 days and fitness training once every 7 days. If he did weight training on January 1st and fitness training on January 3rd, when will Sergio next have weight training and fitness training on the same day?

✓ table showing days of the month o.e.

✓ attempt to find when the two events occur simultaneously

31st January ✓ [3]

- b. A house of cards is formed by balancing playing cards on top of one another:



How many cards are needed to produce a house of cards 10 levels high?

Level	1	2	3	4	5	6	7	8	9	10
No. cards	2	7	15	26	40	57	77	100	126	155

+5 +8 +11 +14

+3 +3 +3 etc.

✓ table o.e. showing a calculation of at least one more level

✓✓ two or more correct level calculations

155 ✓ [3]

THE END