

# High School Mathematics Test 2015

Year 9

*Ratio and Rates*

Non Calculator

## Skills and Knowledge Assessed:

- Solve a range of problems involving rates and ratios, with and without digital technologies (ACMNA188)

Name \_\_\_\_\_

## Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1. Simplify the ratio 16 : 20.

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2. There are 12 basketball players and 18 rugby players on a bus.  
What is the ratio of basketball players to rugby players in simplest form?

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3. Divide \$56 in the ratio 3 : 4.

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4. The ratio of drivers to passengers in a traffic jam is 2 : 5.  
If there were 450 passengers, how many drivers were there?

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5.	To mix a drink, 600g of flavour granules are added to 8 litres of water. Express this in grams per litre.  ..... .....
6.	Clara runs a 42 km marathon in 5 hours. What was her speed in km/h?  ..... .....
7.	Write 1.25 : 0.5 in simplest terms.  ..... .....
8.	Divide an hour and a half in the ratio 3 : 2.  ..... .....
9.	Simplify the ratio $\frac{3}{5} : \frac{7}{10}$ .  ..... .....
10.	At a talent quest there are 25 participants. The ratio of participants to audience members is 5 : 36. How many audience members were there?  ..... .....

11. There are 48 pixels per  $\text{cm}^2$  on a large rectangular screen TV.  
If there are 2 400 000 pixels on the screen, what is its area (in square metres)?  
There are 10 000  $\text{cm}^2$  in one  $\text{m}^2$ .

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12. A town has a population density of 825 people/ $\text{km}^2$ .  
A block in the town has an area of 0.4  $\text{km}^2$ .  
How many people would there be in the block?

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13. Simplify the ratio  $1\frac{2}{3}$  hours : 45 minutes.

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14. Simplify the ratio 72 : 24 : 30.

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15. Darcy has a collection of 2 600 music tracks on his phone.  
The ratio of Metal : Hip Hop : Pop is 5 : 8 : 7.  
How many Hip Hop tracks are there?

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16. The ratio of novels : biographies : manuals on a book shelf is 20 : 5 : 2.

There are 35 books which are either biographies or manuals.

How many books are there altogether on the shelf?

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17. The temperature in a kiln is rising at a steady rate of  $20^{\circ}\text{C}$  per minute.

Its temperature started at  $20^{\circ}\text{C}$  at 9:15 am. What time will it reach its target temperature of  $1200^{\circ}\text{C}$ ?

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18. A grade of printing paper weighs 80 grams per square metre.

A single sheet of the paper has an area of  $600\text{ cm}^2$ .

What would be the mass of a ream (500 sheets) of this paper?

There are  $10\,000\text{ cm}^2$  in one  $\text{m}^2$ .

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# High School Mathematics Test 2015

Calculator Allowed

Year 9

## Ratio and Rates


Name \_\_\_\_\_

### Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

- |    |   |
|----|---|
| 1. | On one day an auto sales site sells 120 cars and 25 vans.<br>What is the ratio of cars to vans, in simplest form?   |
|    | A. 19 : 5                      B. 24 : 5                      C. 29 : 5                      D. 29 : 24   |
| 2. | In a group of people, the ratio of males to females is 4 : 5.<br>If there were 48 males, how many females were there?                                     |
|    | A. 60                      B. 72                      C. 80                      D. 88  |
| 3. | The ratio of cats to dogs boarding at a pet hostel is 15 : 22.<br>There were 88 dogs at the hostel. How many animals were there altogether at the hostel? |
|    | A. 60                      B. 88                      C. 120                      D. 148  |
| 4. | Simplify the ratio 15 : 24.   |
|    | A. 3 : 5                      B. 5 : 6                      C. 5 : 8                      D. 7 : 12   |
| 5. | A car travels 450 km and takes 5 hours for the trip.<br>What is its average speed in km/h?  |
|    | A. 45 km/h                      B. 75 km/h                      C. 90 km/h                      D. 120 km/h   |

6.	A mine produces ore at a rate of 375 tonnes per hour. How many tonnes would it produce in three 8 hour shifts?  A. 3000 t                      B. 4500 t                      C. 6000 t                      D. 9000 t
7.	The area of Sara's room is $16.2 \text{ m}^2$ , and the area of Zara's room is $19.8 \text{ m}^2$ . What is the ratio of Sara's room to Zara's room?  A. 7 : 11                      B. 9 : 11                      C. 9 : 20                      D. 11 : 20
8.	Simplify the ratio $12\frac{1}{2} : 18\frac{3}{4}$ .  A. 2 : 3                      B. 2 : 5                      C. 3 : 4                      D. 3 : 5
9.	The ratio of Mackenzie's age to Fletcher's age is $6\frac{1}{2}$ years : 18 months. This ratio expressed in simplest form is:  A. 3 : 1                      B. 13 : 3                      C. 13 : 6                      D. 39 : 5
10.	The votes received by Tony and Bill in the election for school captain were in the ratio 5 : 6. If Bill received 78 votes, how many votes were cast altogether?  A. 65                      B. 130                      C. 143                      D. 172
11.	A plough was used to till 250 hectares of land, taking 6 hours and 15 minutes to do the job. At what rate did it complete the job?  A. 40 hectares/hour                      B. 41 hectares/hour C. 45 hectares/hour                      D. 46 hectares/hour
12.	Aiden is a clerical assistant and can type at 250 characters per minute. If an average sentence is 75 characters long, how many sentences would he type in an hour and a half?  A. 5                      B. 30                      C. 250                      D. 300

13.	There are 130 players on contract to the Devils football team. The ratio of players in the A grade, B grade and C grade squads is 2 : 3 : 5. How many are there in the B grade squad?	
	A. 10                      B. 13                      C. 39                      D. 78	
14.	The ratio of Angelfish : Butterflyfish : Clownfish in an aquarium is 6 : 11 : 4. If there are 66 Angelfish, how many of the other two varieties are there?	
	A. 44                      B. 90                      C. 121                      D. 165	
15.	The ratio of the number of teeth in three gears is 7 : 15 : 18. If the gear with the least teeth has 35, how many teeth are there altogether on the three gears?	
	A. 75                      B. 90 C. 165                      D. 200	
16.	Kade scores 15000 points after playing Hero's Quest for 20 minutes. At this rate how many points would he score in 45 minutes?	
	A. 6 667 points                      B. 33 750 points C. 22 500 points                      D. 50 625 points	
17.	John is a passenger in a bus travelling on a freeway. There are markers on the freeway every 500 metres, used for aerial speed checks. John times the bus and finds it takes 20 seconds for the bus to travel from one marker to the next. How fast is the bus travelling?	
	A. 25 km/hour                      B. 60 km/hour                      C. 90 km/hour                      D. 100 km/hour	
18.	Felix loads a truck with pallets which each hold 400 boxes of cans of cola. Each box holds 24 cans, and each can holds 375 ml of cola. He loads 16 pallets on the truck in 4 hours. What is the rate at which the cola is loaded in litres/hour?	
	A. 14 400 litres/hr                      B. 57 600 litres/hr                      C. 153 600 litres/hr                      D. 144 00 litres/hour	

# *High School Mathematics Test 2015*

## *Multiple Choice Answer Sheet*

### *Ratio and Rates*

Name \_\_\_\_\_

Completely fill the response oval representing the most correct answer.

- |     |   |                       |   |                       |   |                       |   |                       |
|-----|---|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|
| 1.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 2.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 3.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 5.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 9.  | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 10. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 11. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 13. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 14. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 15. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 16. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 17. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 18. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |



# High School Mathematics Test 2015

Year 9

## Ratio and Rates

Non Calculator

### Section 1 Short Answer Section

## ANSWERS

No.	WORKING	ANSWER
1.	$16 : 20 = 16 \div 4 : 20 \div 4$ $= 4 : 5$	4 : 5
2.	$B : R = 12 : 18$ $= 2 : 3$	2 : 3
3.	$3 + 4 = 7$ parts Each part = $56 \div 7 = 8$ Ratio = $3 \times 8 : 4 \times 8$ $= \$24 : \$32$	\$24 : \$32
4.	$D : P = 2 : 5$ $= D : 450$ For passengers, 5 has been multiplied by 90 to give 450 so multiply 2 by 90 for drivers $= 180$ There are 180 drivers.	180 drivers
5.	Rate = $\frac{600g}{8L}$ $= 75$ grams/litre.	75 grams/litre
6.	Speed = $\frac{42 \text{ km}}{5 \text{ hrs}}$ $= 8\frac{2}{5} \text{ km/h}$ $= 8.4 \text{ km/h}$	8.4 km/h
7.	$1.25 : 0.5 = 1.25 \times 100 : 0.5 \times 100$ $= 125 : 50$ $= 5 : 2$	5 : 2
8.	An hour and a half = 90 minutes $3 + 2 = 5$ parts Each part = $90 \div 5 = 18$ Ratio = $3 \times 18 : 2 \times 18$ $= 54 : 36$	54 : 36

9.	$\frac{3}{5} : \frac{7}{10} = \frac{6}{10} : \frac{7}{10}$ $= 6 : 7$	6 : 7
10.	$P : A = 5 : 36$ $= 25 : A$ Multiply 5 by 5 to get 25. Multiply 36 by 5 to give audience. Audience = 180	180 in audience
11.	48 pixels per $\text{cm}^2$ and there are 2 400 000 pixels, so number of $\text{cm}^2 = 2400000 \div 48$ $= 50\,000 \text{ cm}^2$ $= \frac{50000}{10000} \text{ m}^2$ $= 5 \text{ m}^2$	$5\text{m}^2$
12.	Number of people = $825 \times 0.4$ $= 330.0$ $= 330 \text{ people}$	330 people
13.	$1\frac{2}{3} \text{ hours} : 45 \text{ minutes} = 60 + 40 \text{ minutes} : 40 \text{ minutes}$ $= 100 : 45$ $= 20 : 9$	20 : 9
14.	$72 : 24 : 30 = \frac{72}{6} : \frac{24}{6} : \frac{30}{6}$ $= 12 : 4 : 5$	12 : 4 : 5
15.	Number of parts = $5 + 8 + 7 = 22$ Number Hip Hop tracks = $\frac{8}{20} \times \frac{2600}{1}$ $= \frac{4}{10} \times \frac{2600}{1}$ $= 4 \times 260$ $= 1040 \text{ Hip Hop tracks}$	1040 Tracks

16.	<p>Total parts = <math>20 + 5 + 2 = 27</math></p> <p>Total Biog and Manuals = <math>5 + 2 = 7</math></p> <p>Factor = <math>\frac{35}{7} = 5</math></p> <p>Total number of books = <math>27 \times 5 = 135</math></p>	135 Books
17.	<p>To go from <math>20^{\circ}</math> to <math>1200^{\circ}</math> is an increase of <math>1180^{\circ}</math></p> <p>Time for increase = <math>\frac{1180}{20} = 59</math> minutes</p> <p>Starts at 9:15 am so reaches temp at 10:14 am</p>	10:14 am
18.	<p>Total area of paper = <math>600 \text{ cm}^2 \times 500</math> sheets</p> <p><math>= 300\,000 \text{ cm}^2</math></p> <p><math>1 \text{ m}^2 = 100 \text{ cm} \times 100 \text{ cm} = 10\,000 \text{ cm}^2</math></p> <p>Number of square metres = <math>300\,000 \div 10\,000</math></p> <p><math>= 30 \text{ m}^2</math></p> <p>Mass = <math>80\text{g} \times 30</math></p> <p><math>= 2400 \text{ g}</math></p> <p><math>= 2.4 \text{ kg}</math></p>	<p>2400 grams</p> <p>or 2.4 kg</p>

# High School Mathematics Test 2015

Year 9

## Ratio and Rates

Calculator Allowed

### Section 2 Multiple Choice Section

## ANSWERS

No.	WORKING	ANSWER
1.	$\begin{aligned} \text{Ratio} &= 120 : 25 \\ &= \frac{120}{5} : \frac{25}{5} \\ &= 24 : 5 \end{aligned}$	B
2.	$\begin{aligned} M : F &= 4 : 5 \\ &= 48 : F \\ \text{Factor} &= \frac{48}{4} = 12 \\ F &= 5 \times 12 = 60 \end{aligned}$	A
3.	$\begin{aligned} C : D &= 15 : 22 \\ &= C : 88 \\ \text{Factor} &= \frac{88}{22} = 4 \\ C &= 4 \times 15 = 60 \\ \text{Total animals} &= 60 + 88 = 148 \end{aligned}$	D
4.	$\begin{aligned} 15 : 24 &= \frac{15}{3} : \frac{24}{3} \\ &= 5 : 8 \end{aligned}$	C
5.	$\text{Speed} = \frac{450}{5} = 90 \text{ km/h}$	C
6.	$\begin{aligned} \text{Time} &= 3 \times 8 = 24 \text{ hours} \\ \text{Production} &= 375 \times 24 = 9000 \text{ tonnes} \end{aligned}$	D
7.	$\begin{aligned} S : Z &= 16.2 : 19.8 \\ &= 162 : 198 \\ &= 81 : 99 \\ &= 9 : 11 \end{aligned}$	B
8.	$\begin{aligned} 12\frac{1}{2} : 18\frac{3}{4} &= \frac{25}{2} : \frac{75}{4} \\ &= \frac{50}{4} : \frac{75}{4} \\ &= 50 : 75 \\ &= 2 : 3 \end{aligned}$	A

9.	$6\frac{1}{2}$ years : 18 months = 78 months : 18 months $= 39 : 9$ $= 13 : 3$	B
10.	$T : B = 5 : 6$ $= T : 78$ Factor = $\frac{78}{6} = 13$ $T = 13 \times 5$ $= 65$ Total votes = $65 + 78 = 143$	C
11.	6 hours 15 min = 6.25 Rate = $\frac{250}{6.25}$ $= 40$ hectares/hour	A
12.	1.5 hours = 90 minutes In 90 minutes he would type $90 \times 250 = 22500$ characters Number of sentences = $22500 \div 75 = 300$ sentences	D
13.	Number of parts = $2 + 3 + 5 = 10$ Each part = $\frac{130}{10} = 13$ B grade squad = $13 \times 3 = 39$	C
14.	$A : B : C = 6 : 11 : 4$ $= 66 : B : C$ Factor = $\frac{66}{6} = 11$ $B = 11 \times 11 = 121$ $C = 11 \times 4 = 44$ Total $B + C = 121 + 44 = 165$	D
15.	Call gears $X, Y, Z$ $X : Y : Z = 7 : 15 : 18$ $= 35 : Y : Z$ Factor = $\frac{35}{7} = 5$ $Y = 15 \times 5 = 75$ $Z = 18 \times 5 = 90$ Total of three gears = $35 + 75 + 90$ $= 200$	D

16.	$\text{Rate} = \frac{15000}{20} = 750 \text{ points/minute}$ $\text{In 45 minutes score} = 45 \times 750 = 33\,750 \text{ points}$	B
17.	$\text{Speed} = \frac{500}{20}$ $= 25 \text{ metres/sec}$ $= \frac{25 \times 60 \times 60}{1000}$ $= 90 \text{ km/hour}$	C
18.	$\text{Number of cans} = 16 \times 400 \times 24$ $= 153\,600 \text{ cans}$ $\text{Number of litres} = \frac{153\,600 \times 375}{1000}$ $= 57\,600 \text{ litres}$ $\text{Rate} = \frac{57\,600}{4}$ $= 14\,400 \text{ litres/hour}$	A

# High School Mathematics Test 2015

## Multiple Choice Answer Sheet

### Ratio and Rates

Name ANSWERS

Completely fill the response oval representing the most correct answer.

- |     |   |                                  |   |                                  |   |                                  |   |                                  |
|-----|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|
| 1.  | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
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| 13. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 14. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 15. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input checked="" type="radio"/> |
| 16. | A | <input type="radio"/>            | B | <input checked="" type="radio"/> | C | <input type="radio"/>            | D | <input type="radio"/>            |
| 17. | A | <input type="radio"/>            | B | <input type="radio"/>            | C | <input checked="" type="radio"/> | D | <input type="radio"/>            |
| 18. | A | <input checked="" type="radio"/> | B | <input type="radio"/>            | C | <input type="radio"/>            | D | <input type="radio"/>            |