High School
Mathematics Test 2014

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. There are 15 aeroplanes and 4 helicopters at an airfield waiting to take off.
What is the ratio of helicopters to aeroplanes?

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2. Simplify the ratio 20 : 35.

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3. There are 40 sedans and 24 hatchbacks in a car park. What is the ratio of sedans to hatch backs in simplest form?

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4. Divide $200 between John and Paul in the ratio 3 : 2.

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5. On a recent afternoon, a heavy vehicle checkpoint was visited by trucks and buses in the ratio 15 : 4. There were 80 buses. How many trucks were there?

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6. Mike walks 250 m in 50 seconds.
What is his speed in m/s?

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7. Simplify the ratio 162 : 72.

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8. A survey finds that the ratio of open space to buildings in a city is 3 : 17.
What fraction of the city is open space?

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9. There were 350 customers in the Sports Energy store last week. The ratio of males to females was 4 : 3 respectively. How many males were there?

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10. Simplify the ratio $1\frac{1}{2}$ minutes : 15 seconds.

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11. When Freida walked along the beach she counted the number of people on surfboards and surf skis.
The ratio of surfboards to surf skis was 8 : 5.
There were 48 surfboard riders.
How many were on surf skis?

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12. Adrian regularly runs 12 km in training for marathons.
His average speed is 5 m/s.
How many minutes would one of his training runs take?

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13. Simplify the ratio $2\frac{2}{3} : 1\frac{5}{6}$

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14. The ratio of pipers : drummers : spectators at a highland band competition was 5 : 7 : 18.
The pipers and drummers together added up to 360 people.
How many spectators were there?

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15. To mix a paint, Pablo uses Cyan : Magenta : Yellow in the ratio 5 : 3 : 2. He has plenty of paint to mix except for only having 6 ml of yellow remaining. What is the largest amount of paint he could make?

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16. Aimee, Brad and Cathy divide 360 toffees between them in the ratio 4 : 3 : 2. How many more toffees than Brad, does Aimee get?

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17. Convert 2 ml per second into litres per hour.

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18. A city intersection has an average of 360 vehicles/hour pass through it.
Jim sits down at the intersection at 9 am, to complete a survey by observing the vehicles passing through.
What time would he finish if he needs to observe 2100 vehicles?

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Year 9 | *Ratio and Rates* | Calculator Allowed

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. A radio station plays 18 rock tracks and 24 hip hop tracks in a three hour program. What is the ratio of rock to hip hop tracks, in simplest form?

   A. 3 : 4 B. 4 : 3 C. 3 : 7 D. 4 : 7

2. The ratio of green to red jelly beans in a pack is 2 : 3.
   If there are 60 jelly beans in the pack, how many are red?

   A. 12 B. 24 C. 36 D. 48

3. The ratio of pens to pencils in a drawer is 5 : 2.
   If there are 24 pencils, how many pens are there?

   A. 12 B. 24 C. 48 D. 60

4. Kelly checks her heart rate after a run. She counts 36 beats in 30 seconds. What is her heart rate?

   A. 18 beats/minute B. 36 beats/minute
   C. 54 beats/minute D. 72 beats/minute

5. An engine makes 3 000 revolutions/minute (rpm). How many revolutions would it make in 6½ minutes?

   A. 18 500 B. 19 500 C. 21 000 D. 24 000

6. A garden has 24 m^2 of paths, 48 m^2 of garden beds and 144 m^2 of lawn.
   What is the ratio of paths to the rest of the garden?

   A. 1 : 2 B. 1 : 4 C. 1 : 6 D. 1 : 8

7. Tayla and Maya take $2\frac{1}{2}$ hours and 1 hour and forty minutes respectively to complete training run.
   What is the ratio of the times they take to complete the run?

   A. 3 : 2 B. 2 : 5 C. 3 : 5 D. 5 : 6

8. Holly went to a presentation where the ratio of adults to school students was 3 : 4. There were 120 adults at the presentation. How many people were at the presentation?

A. 240 B. 280 C. 320 D. 540

9. A plane flies at a groundspeed of 620 km/h.
How long would a flight which is 2 015 km take?

A. 3 hours exactly B. 3 hours and 15 minutes

C. 3 hours and 25 minutes D. 3 hours and 30 minutes

10. The cost of a single padded post bag is $1.20.
They can also be bought in a bulk pack of 100 for $52.00.
How much per bag is saved by buying in a bulk pack?

A. $0.43 per bag B. $0.52 per bag C. $0.68 per bag D. $1.20 per bag

11. When 2.6 kg of chocolate is divided in the ratio 2 : 3 : 8, how much is the smallest portion?

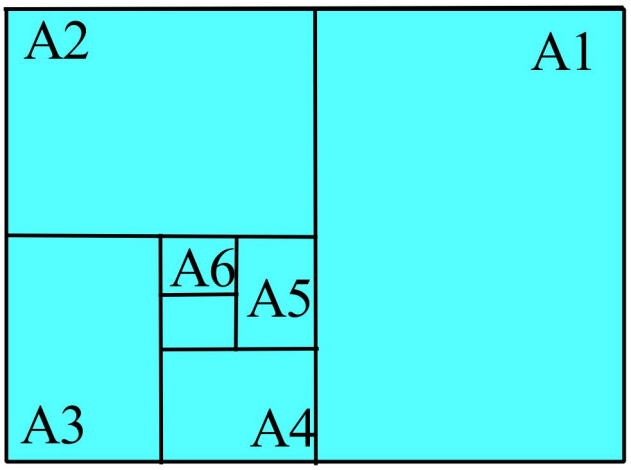
A. 130 grams B. 250 grams C. 300 grams D. 400 grams

12. The ratio of boys to girls in a class was 3 : 4, before two boys and two girls were moved to another class, leaving 14 girls in the class. What is the new ratio of boys to girls in the class?

A. 5 : 6 B. 5 : 7 C. 5 : 12 D. 7 : 12

13. An A0 sheet of paper is shown, divided into smaller paper sizes.
The A0 sheet is cut in half to form two A1 sheets.
The A1 sheet is then cut in half to form two A2 sheets.
The A2 is cut in half to form two A3 sheets etc.

What is the ratio of the area of an A5 sheet to an A1 sheet?



A. 1 : 4 B. 1 : 8

C. 1 : 16 D. 1 : 32

14. A car is travelling at 72 km/h along a road which has telephone poles spaced every 200 metres.
How long would it take the car to move from one pole to the next?

A. 10 seconds B. 15 seconds C. 20 seconds D. 30 seconds

15.

Zahra and Ali work in a factory packing bottles of jam into boxes which hold 120 bottles.
Zahra can pack a box in 5 minutes and it takes Ali 6 minutes to pack the same box.
How long would it take them, working together to pack 55 boxes?

A. 2¼ hours B. 2⅓ hours C. 2½ hours D. 2¾ hours

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Ratio and Rates

Multiple Choice Answer Sheet

Name _____

Completely fill the response oval representing the most correct answer.

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭

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Ratio and Rates

ANSWERS

Section 1 (1 mark each)	
	Working and Answers
1.	Helicopters : Aeroplanes = 4 : 15.
2.	20 : 35 = 4 : 7
3.	Sedans : Hatchbacks = 40 : 24 = 5 : 3
4.	John gets $\frac{3}{5}$ of \$200 $= \frac{3}{5} \times 200$ $= 120$ Paul gets $200 - 120 = 80$ John Paul = \$120 : \$80.
5.	$T : B = 15 : 4$ $= T : 80$ (Mult by 20) $T = 15 \times 20$ = 300 trucks
6.	250 *m* in 50 seconds = $\frac{250}{50}$ m/s = 5 m/s
7.	162 : 72 = 81 : 36 = 9 : 4
8.	Ratio is *OS* : *B* = 3 : 17 ; a total of 20 parts. Fraction open space = $\frac{3}{20}$.
9.	Ratio *M* : *F* = 4 : 3 ; which is 7 parts Fraction who were males = $\frac{4}{7}$ Number who were males = $\frac{4}{\cancel{7}} \times \frac{\cancel{350}\ 50}{1}$ $= 4 \times 50$ = 200 males
10.	$1\frac{1}{2}$ minutes : 15 seconds = 90 seconds : 15 seconds = 90 : 15 = 6 : 1

11.	Boards : Skis = 8 : 5 8 : 5 = 48 : x (Multiplied by a factor of 6) x = 5 × 6 = 30 Skis
12.	Speed = 5 m/s. Distance = 12 km = 12 000 m Time = distance/speed $= \frac{12000}{5}$ = 2400 seconds $= \frac{2400}{60}$ = 40 minutes.
13.	$2\frac{2}{3} : 1\frac{5}{6} = \frac{8}{3} : \frac{11}{6}$ $= \frac{16}{6} : \frac{11}{6}$ = 16 : 11
14.	$P : D : S$ = 5 : 7 : 18 $P + D$ = 360 $P + D : S$ = 12 : 18 = 2 : 3 $P + D : S$ = 2 : 3 = 360 : S (Multiplied by 180) S = 3 × 180 = 540 spectators
15.	Cyan : Magenta : Yellow = 5 : 3 : 2 = $C : M$: 6 (Multiply by 3) C = 5 × 3 = 15 M = 3 × 3 = 9 Total amount of paint = 15 + 9 + 6 = 30 ml of paint.
16.	Aimee gets $\frac{4}{9}$ of 360 = $\frac{4}{9}$ × 360 = 160 Brad gets $\frac{3}{9}$ of 360 = $\frac{1}{3}$ × 360 = 120 Aimee gets 40 more.
17.	2 ml/sec = 2 × 60 × 60 ml/hr = 7200 ml/hr = 7200 ÷ 1000 = 7.2 l/hr

18.	Time taken $= \frac{2100}{360}$ $= 5\frac{300}{360}$ $= 5\frac{50}{60}$ = 5 hrs and 50 minutes Time to finish = 9:00am + 5 hr and 50 minutes = 2: 50 pm

Section 2 (1 mark each)		
	Working	Answers
1.	$R : H = 18 : 24$ $= 3 : 4$	A
2.	Red $= \frac{3}{5} \times 60$ $= 36$ jelly beans	C
3.	$5 : 2 =$ Pens : 24 (Multiply by 12) Pens $= 5 \times 12$ $= 60$	D
4.	36 beats per 30 seconds $= 36 \times 2$ beats per minute $= 72$ beats per minute	D
5.	No revolutions $= 3000 \times 6.5$ $= 19500$ revs	B
6.	Paths : Rest $= 24 : (48 + 144)$ $= 24 : 192$ $= 1 : 8$	D
7.	$2\frac{1}{2}$ hrs $\therefore$ 1 hr 40 min $= 150$ min $\therefore$ 100 min $= 3 : 2$	A
8.	$A : S = 3 : 4$ $120 : S = 3 : 4$ (multiply by 40) $S = 4 \times 40 = 160$ Total at pres $= 160 + 120$ $= 280$	B
9.	Time $= 2015 \div 620$ $= 3.25$ hours $= 3$ hours and 15 minutes	B
10.	Cost per bag in bulk $= \frac{52.00}{100}$ $= \$0.52$ per bag. Cost individually $= \$1.20$ per bag Amount saved $= 1.20 - 0.52 = \$0.68$ per bag	C
11.	Smallest portion $= \frac{2}{13}$ of 2.6 kg $= 0.4$ kg $= 400\ g$	D

12.	There are now 14 girls, so previously there were 16. Previous ratio was 3 : 4 so $3 : 4 = B : 16$ (Multiply by 4) $B = 3 \times 4$ $B = 12$ There were 12 boys, so now there are 12 – 2 There are now 10 boys. Now ratio = 10 : 14 = 5 : 7	B
13.	There are 2 A5 in an A4, so 4 in an A3, 8 in an A2 and 16 in an A1. Ratio is 1 : 16	C
14.	Speed = 72km/h $= \frac{72 \times 1000}{60 \times 60} m/s$ $= 20 m/s$ Distance = 200 m Time = $\frac{200}{20}$ = 10 seconds	A
15.	In an hour, Zahra packs 12 boxes and Ali packs 10 boxes, so together they pack 22 boxes per hour. Time to pack 55 boxes = $\frac{55}{22} = 2.5$ $= 2\frac{1}{2}$ hours.	C

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Multiple Choice Answer Sheet

Name ___Marking Sheet

Completely fill the response oval representing the most correct answer.

1.	A ●	B ○	C ○	D ○
2.	A ○	B ○	C ●	D ○
3.	A ○	B ○	C ○	D ●
4.	A ○	B ○	C ○	D ●
5.	A ○	B ●	C ○	D ○
6.	A ○	B ○	C ○	D ●
7.	A ●	B ○	C ○	D ○
8.	A ○	B ●	C ○	D ○
9.	A ○	B ●	C ○	D ○
10.	A ○	B ○	C ●	D ○
11.	A ○	B ○	C ○	D ●
12.	A ○	B ●	C ○	D ○
13.	A ○	B ○	C ●	D ○
14.	A ●	B ○	C ○	D ○
15.	A ○	B ○	C ●	D ○