

THE MOST CHALLENGING QUESTIONS

100

10

AIM FOR
TOP SELECTIVE HIGH SCHOOLS

MAXIMISE YOUR CHANCES OF SUCCESS
100 TOUGHEST QUESTIONS DIVIDED INTO 10 TESTS

AGES | 10 - 12

MATHS

- Maximise your mathematical potential
- Identify and eliminate areas of weakness
- Build exam techniques
- Improve time-management skills
- Boost your confidence

Test 04

- Time Limit(Suggested Time) : 8 Minutes

INSTRUCTIONS

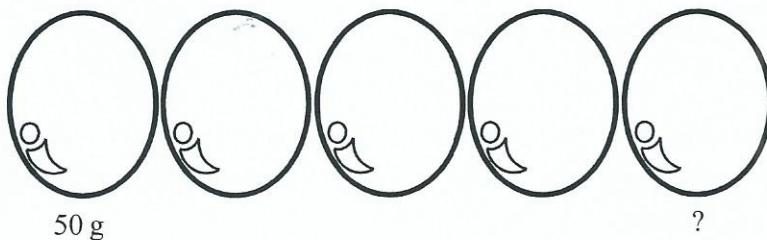
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- 1 Jason stuck two identical cubes together. He then painted each square face so that no adjacent faces shared a colour. What is the least number of different colours Jason must use?

- A 3
- B 5
- C 4
- D 6

- 2 Five eggs are weighed one at a time. The first egg weighs 50 grams. When the first and second eggs are weighed together, the average weight of the eggs increases by 2 grams. When the third egg is weighed, the average weight of the eggs increases by 2 grams again. This continues after each egg is weighed.

What is the weight of the last egg?

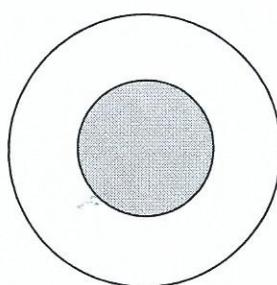


- A 66 grams
- B 58 grams
- C 60 grams
- D 64 grams

- 3 A ship sets off from the tip of South America on a voyage to Antarctica. The ship travels at 150 km/h for only 13 hrs/day for 2 weeks. Once it reaches the region of Antarctica it travels at $\frac{1}{3}$ of its speed due to ice blockages for 2 full days. What is the total distance of the trip?

- A 44 100 km
- B 2.97 km
- C 44.1 km
- D 29 700 km

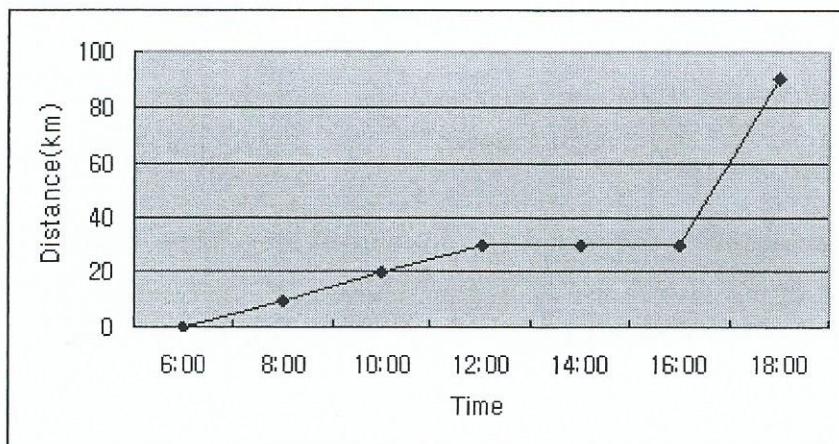
- 4 Matilda's father takes 20 minutes to mow the lawn, but Matilda takes 30 minutes to do the same job. If they worked together, how long would it take to mow the lawn?
- A 12 minutes
B 15 minutes
C 25 minutes
D 10 minutes
- 5 The diameters of the two circles on the target are 14 cm and 28 cm. What fraction of the target is shaded?



- A $\frac{1}{7}$
B $\frac{1}{4}$
C $\frac{1}{2}$
D $\frac{2}{7}$

Question 6 refers to the graph seen below.

This graph shows Tim's journey over a period of twelve hours starting from 6:00.

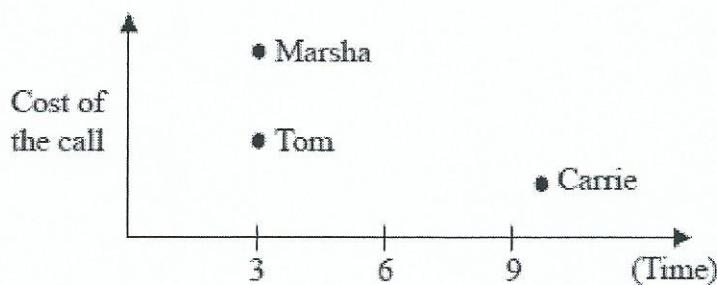


- 6 What was the difference in Tim's speed between the first half of the day and the second?

- A 30 km/h
- B 5 km/h
- C 10 km/h
- D no difference

- 7 The cost of a phone call depends on the time taken as well as the distance covered.

The longer the distance covered by the call, the more expensive the call. Similarly, the longer the call, the more expensive the call.



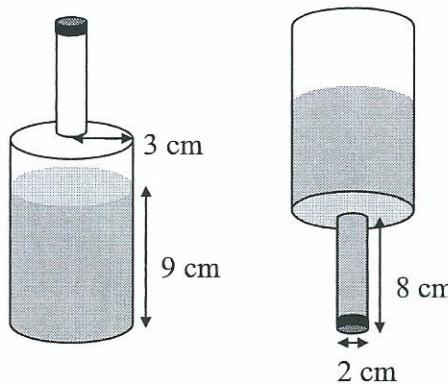
Using the information given, which of the following statements must be true?

- A The distance Carrie called was greater than Marsha and Tom.
- B Marsha made a call over the shortest distance.
- C Carrie made a call over the shortest distance.
- D None of the above.

- 8 Two taps are filling up a kilolitre capacity tank. One of the taps is filling the tank at a rate of 3 L every 10 seconds, while the second tap allows 4 L of water into the tank every 8 seconds.

How long will it take to fill the tank?

- A 12 500 seconds
B 12 minutes and 5 seconds
C 12.5 minutes
D 20 minutes and 50 seconds
- 9 What is the reflex angle between the hands of a clock at 6:20?
- A 300°
B 60°
C 315°
D 290°
- 10 A vinegar bottle is constructed out of two cylinders; the neck and the main body. The neck has a diameter of 2 cm and a height of 8 cm. The main body has a radius of 3 cm. When standing upright, the vinegar fills the bottle to a height of 9 cm.



If the bottle is turned upside down, what is the volume of the vinegar still remaining in the main body? (Use $\pi = 3.14$)

- A 254.34 cm^3
B 153.86 cm^3
C 197.82 cm^3
D 229.22 cm^3

END OF TEST 04

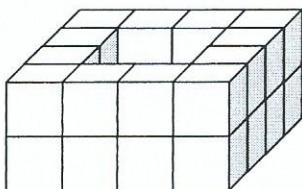
Test 05

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- 1 Pilar used 28 cubic bricks to build the structure below. Each brick has a side length of 2 cm. He built the structure so that there was a base.



How much concrete can he pour into the structure?

- A 32 mL
- B 64 mL
- C 16 mL
- D 24 mL

Question 2 refers to the following information.

The following is a comparison of average property prices in different locations.

An average property in Pyrmont costs \$1 200 000 plus \$50 000 in taxes. It is 1.25 times more expensive than one in St Ives. George St property is twice as expensive as York St property which is \$100 000 more expensive than Balmain property. Pitt St property is 1.5 times more expensive than Pyrmont property, and St Ives property is \$50 000 more expensive than George St property.

- 2 What is the average cost of property in George Street?

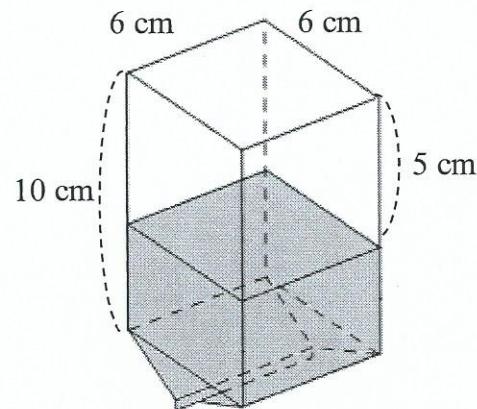
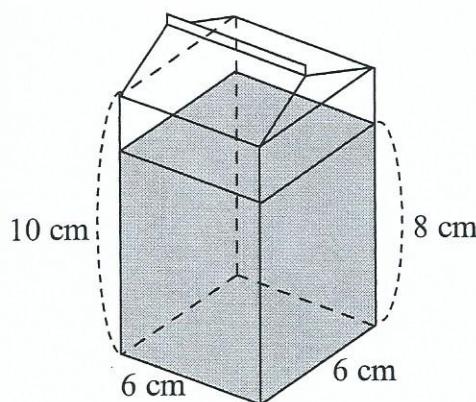
- A \$875 000
- B \$850 000
- C \$700 000
- D \$950 000

- 3 There are 24 students in class A and 32 students in class B. The average mark in a test in class A is 60% and in class B is 70%.

What would be the average mark of both classes? Give the closest answer.

- A 65%
- B 66%
- C 64%
- D 63%

- 4** Sally is trying to find the volume of the milk carton shown below. If the volume of milk in the first diagram is the same as the milk in the second diagram, find the volume of the entire milk carton.



- A** 180 cm^3
- B** 288 cm^3
- C** 360 cm^3
- D** 468 cm^3

- 5** These number groups follow the same rule. Which number best replaces X?

15	729	6
----	-----	---

8	27	5
---	----	---

X	125	4
---	-----	---

- A** 7
- B** 11
- C** 8
- D** 9

- 6** James wants to sell his set of antique statues. If he sells the set of statues for \$4 800, he would make a profit of 20%. How much should James sell them for if he wants a profit of 75%?

- A** \$8200
- B** \$7500
- C** \$6250
- D** \$7000

- 7 The interest rate on my savings account was 3.25% p.a. Under a special promotion, it rose to 5% p.a.

How much more interest would I receive each year, if I had \$325 000 in savings?

- A \$5 687.50
- B \$16 250.00
- C \$10 562.50
- D \$8 937.50

- 8 One day, different stalls at a jewellery market decided to donate a percentage of their profits to charity.

	Profit (\$)	Donation (%)
Amna's Amulets	3750	20
Bowen's Bows	2234	10
Clarice's Pieces	4420	15
Da-wen's Delights	3879	10

How much money was donated by all four stalls combined?

- A \$1428.30
- B \$2113.40
- C \$2856.40
- D \$2024.30

- 9 Two paintings were sold for \$2400 each through an auction house. If the auction house charges 6% commission on each painting sold, how much does the artist receive for both paintings?

- A \$288.00
- B \$4512.00
- C \$576.00
- D \$2640.80

10 A ship of farm animals is being transported to another country. $\frac{1}{5}$ of the animals developed a disease and $\frac{1}{2}$ of those died from the disease before reaching their destination.

How many developed the disease if 180 of the animals were alive at the destination?

- A 36
- B 40
- C 160
- D 200

END OF TEST 05

Test 06

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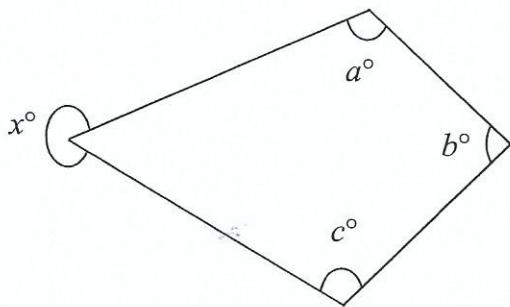
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- 1 If $x = 5$ and $y = 4$, what is the value of $\frac{1}{2}xy^2$?

- A 20
B 40
C 80
D 200

- 2 The angles of size a° , b° , c° and x° are labelled in the diagram below.



What is the value of x ?

- A $a + b + c$
B $360 - (a + b + c)$
C $a + b - c$
D $360b - a - c$

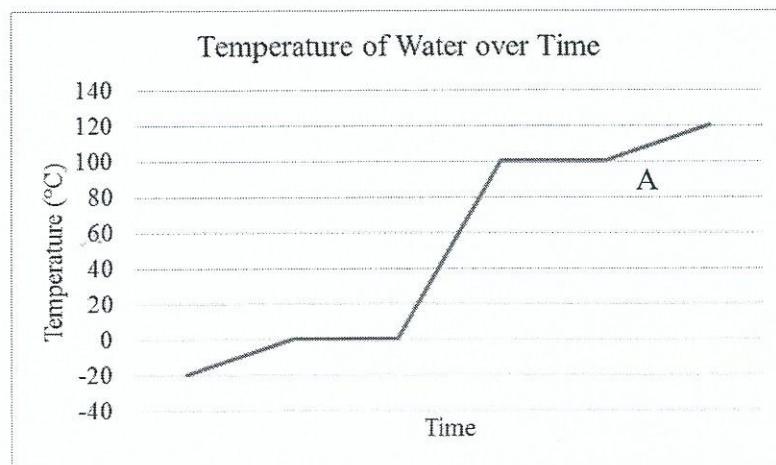
- 3 Samuel flips a coin and rolls a die. What are his chances of getting a head and a 6 or a tail and a 3?

- A $\frac{1}{2}$
B $\frac{1}{12}$
C $\frac{1}{6}$
D $\frac{1}{4}$

- 4 5 tyres (4 wheels and one spare tyre) were each used equally on a van that had travelled 40000 km. How many kilometres was travelled by each of the 5 tyres?

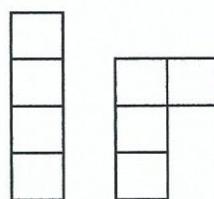
- A 8000
- B 16000
- C 24000
- D 32000

- 5 The graph below shows the temperature and states of water over time.



Which statement best describes what was happening at point A?

- A The water was frozen.
 - B The water was starting to boil.
 - C The solid began changing into a liquid.
 - D The liquid began changing into a gas.
- 6 Tetrominos are shapes made of four squares. There are only a certain number of tetrominos that aren't reflections or rotations of other tetrominos. Two of those shapes are shown.



How many other tetrominos can be made?

- A 2
- B 3
- C 4
- D 5

- 7 The number N is a square number and it has 18 as a factor.

What is the smallest possible value of $\frac{N}{18}$ that is a whole number?

- A 2
- B 3
- C 36
- D 72

- 8 A computer manufacturer makes x computers per week. The production is increased by $y\%$.

Which expression shows the number of computers now made following the production increase?

- A $x(1 + \frac{y}{100})$
- B $x + \frac{y}{100}$
- C $\frac{xy}{100}$
- D $1 + \frac{xy}{100}$

- 9 Here are some hexagons made of counters. In Figure 1, there are 2 counters on each side of the hexagon.

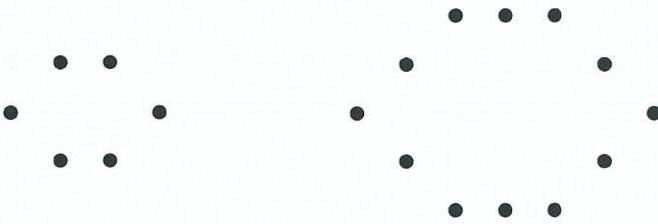


Figure 1

Figure 2

For the hexagon with 36 counters, how many counters would there be on each side?

- A 5
- B 6
- C 7
- D 8

10 If $5\mathfrak{J} = (5 \times 1) + (4 \times 2) + 3$ and $6\mathfrak{J} = (6 \times 1) + (5 \times 2) + (4 \times 3)$, what does $10\mathfrak{J}$ equal?

- A** 142
- B** 111
- C** 140
- D** 110

END OF TEST 06

Test 07

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INSTRUCTIONS

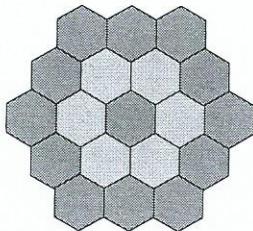
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- 1 Round each amount to the nearest half dollar, add all of these amounts, and then round off the answer to the nearest dollar.

\$13.49 \$36.25 \$142.89 \$0.76 \$1.25

- A \$195
- B \$196
- C \$195.50
- D \$194

The shape is made up of rings of hexagons. The first ring has one hexagon; the second has six; the third has twelve, and so on. All hexagons are equal in size.

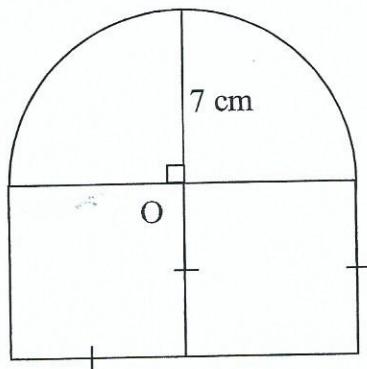


- 2 How many hexagons will there be in the ninth ring?
- A 42
 - B 48
 - C 54
 - D 217
- 3 Joel would like to make a profit of 40% selling a camera he bought for \$325. If listing the item for sale costs \$40, at what price should he list the camera?
- A \$495
 - B \$415
 - C \$455
 - D \$505
- 4 Which is the best value for money?
- A \$7.80 for 750 g
 - B \$12.40 for 1 kg
 - C \$1.55 for 125 g
 - D \$6.00 for 500 g

- 5 Ann invested \$85 at 12% per annum for 8 months. Michael invested the same amount at 10% per annum for 6 months. How much more interest did Ann receive than Michael?

- A \$23.80
- B \$40.00
- C \$25.00
- D \$2.55

- 6 Given that 'O' is the centre of the circle, find the perimeter of this shape. (Use $\pi = \frac{22}{7}$)



- A 72 cm
- B 45 cm
- C 27 cm
- D 50 cm

- 7 There are 108 students in Year 8. 52 students play only basketball. Twenty students play both soccer and basketball, which are the only sports provided.

If all the students play at least one sport.

What fraction of the students only play soccer?

- A $\frac{1}{3}$
- B $\frac{2}{3}$
- C $\frac{13}{27}$
- D $\frac{5}{27}$

- 8 The average weight of 10 boys is 80 kg. The average weight of 8 girls is 70 kg. What is the average weight of the 18 children? Give the closest answer.
- A 70 kg
B 76 kg
C 74 kg
D 80 kg
- 9 Two cars are travelling towards each other at 75 km/h and 90 km/h. How far apart are they 20 minutes before they pass each other?
- A 8.25 km
B 27.5 km
C 33 km
D 55 km
- 10 A train that is 500 metres long is travelling at 70 km/h. How long will the train take to pass completely through a tunnel that is 3 kilometres long?
- A $2\frac{1}{2}$ minutes
B $2\frac{3}{5}$ minutes
C 3 minutes
D $3\frac{1}{10}$ minutes

END OF TEST 07

Test 08

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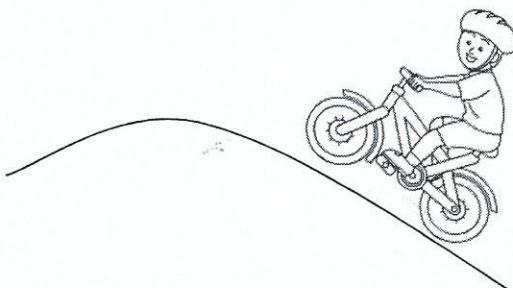
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- 1 The day after 2 days after the day after tomorrow is Tuesday. What day will it be 21 days from today?

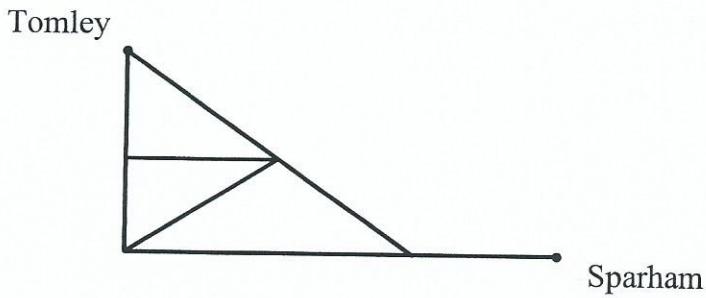
- A Wednesday
- B Friday
- C Thursday
- D Saturday

- 2 The cyclist rides uphill at a speed of 12 km/h, and rides down in the same way at a speed of 20 km/h. He spends 16 minutes less when he rides down. What is the length of the path, which leads to the hill?



- A 8 km
- B 10 km
- C 12 km
- D 14 km

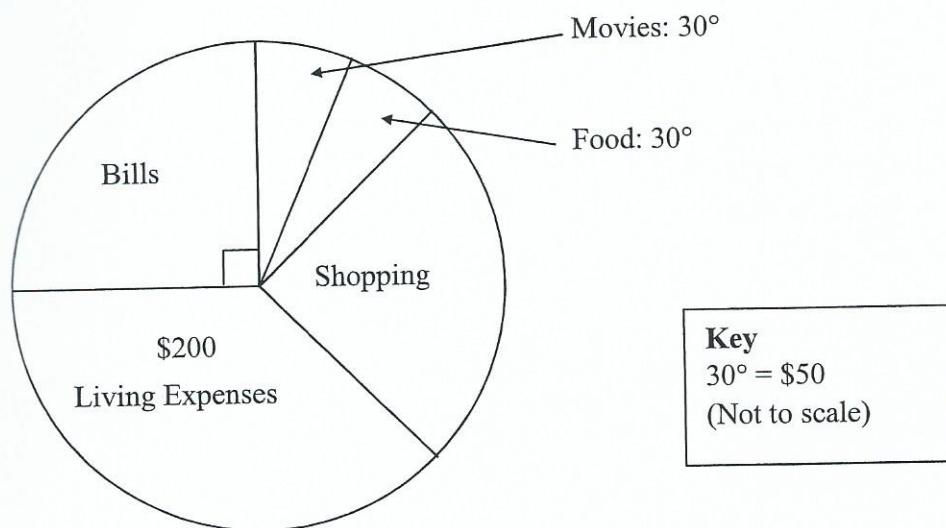
- 3 The following is a simplified map of the roads from Tomley to Sparham.



In how many different ways can Paul drive from Tomley to Sparham without driving along the same road twice?

- A 3
- B 6
- C 5
- D 9

Questions 4 and 5 refer to the pie graph below that shows how Sim spends his weekly income.



4 How much does Sim spend on shopping every month?

- A \$600
- B \$480
- C \$530
- D \$750

5 If half of Sim's living expenses is added onto his bills, how much does Sim pay for his bills on an annual basis?

- A \$13 000
- B \$10 000
- C \$15 000
- D \$12 000

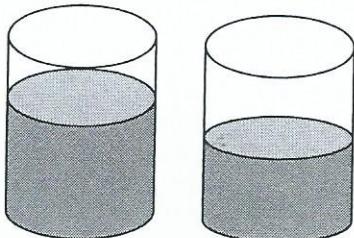
Question 6 refers to the information below.

In a sequence of 15 numbers, the numbers increase by equal increments.
The average of the numbers is 68 and the third number is 28

6 What will be the twelfth number in the sequence?

- A 100
- B 80
- C 92
- D 108

- 7 Which of the following investments will give the most interest to a customer, given that they will invest equal amounts in all of them?
- A 1.6% per annum for a year
B 1.8% per annum for 8 months
C 3% per annum for 6 months
D 3.6% per annum for 4 months
- 8 Containers A and B have the same capacity. Container A is $\frac{3}{4}$ full and Container B is half full.



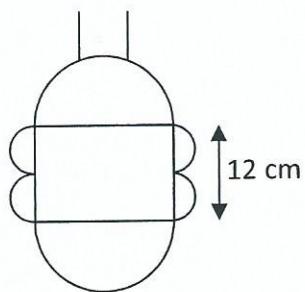
Container A Container B

One quarter of the contents in Container A is poured into Container B. What fraction of Container B is then full?

- A $\frac{3}{4}$
B $\frac{7}{8}$
C $\frac{11}{16}$
D $\frac{19}{24}$

- 9 Bob is an experienced carpenter and can sand a block of wood in 3 minutes, twice as fast as his employees. If three employees helped Bob sand 30 pieces of wood rather than doing it alone, how much time did Bob save?
- A 36 minutes
B 1 hour
C 54 minutes
D 1.5 hours

- 10 The radius of the larger semicircle and the height of the main body is 12 cm. What is the total perimeter of the bug (not including the antennae)?



- A $24\pi\text{cm}$
- B $12\pi\text{cm}$
- C $40\pi\text{cm}$
- D $36\pi\text{cm}$

END OF TEST 08

Test 09

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- 1 Two race cars are competing on a track where one lap is 6 km. Car A has an average speed of 258 km/h and Car B has an average speed of 240 km/h.

Starting from the same position, Car A completes 20 laps before it breaks down. This costs Car A 1 minute as the driver waits for the car to be repaired. As a result, how much of Car A's lead is lost in that time?

- A 2 km
- B 4 km
- C 6 km
- D 10 km

- 2 The table below shows Sydney's average house price for 6 months in 2013.

Month	Average House Price
January	\$580000
February	\$630000
March	\$580000
April	\$680000
May	\$630000
June	\$590000

Which of the following graph types is an inappropriate way to display the information found in the above table?

- A picture graph
- B pie chart
- C line graph
- D bar graph

- 3 Darcy is ordering tiles to cover the surface area of a swimming pool with dimensions of $10 \text{ m} \times 5 \text{ m} \times 2 \text{ m}$.

What is the total area of the tiled surfaces?

- A 170 m^2
- B 100 m^2
- C 160 m^2
- D 110 m^2

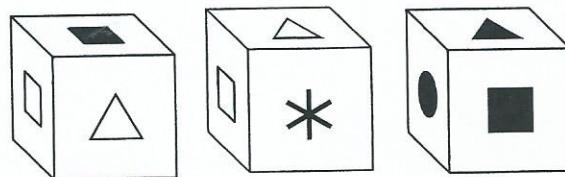
- 4 ‘Purple fire’ paint is made by mixing red and blue paint in the ratio 3 : 1.
 ‘Purple water’ paint is made by mixing red and blue paint in the ratio 1 : 3.
 1 litre of ‘purple fire’ paint is mixed with 500 millilitres of ‘purple water’ by mistake.

How much red paint needs to be added to the mixture to make it purple fire again?

- A 1 L
- B 1.5 L
- C 2 L
- D 2.5 L

Questions 5 and 6 use the following information.

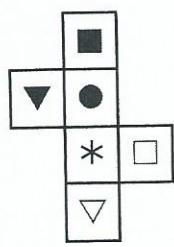
These are three views of the same cube.



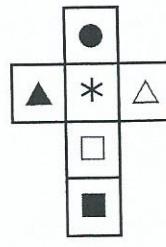
- 5 What shape is on the face opposite □?

- A ▲
- B ●
- C *
- D △

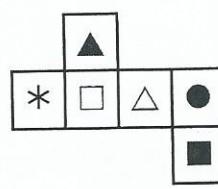
- 6 Choose the appropriate net for the cube above.



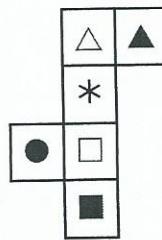
A



B



C

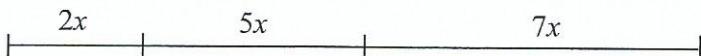


D

- 7 Mitchum is facing North-East and he turns 270° clockwise. What angle is formed between the direction his compass is pointing and the direction he is facing?

- A 45°
- B 90°
- C 270°
- D 135°

- 8 The segment is divided into parts in the ratio of 2:5:7. The distance between the midpoints of the first two parts is 7 cm. Find the length of the segment.



- A 7 cm
- B 22 cm
- C 28 cm
- D 14 cm

Question 9 uses the following information.

A group of 40 people were travelling to the same destination.

Thirty seven of them used the train, 15 caught a bus and 5 walked. 21 people only caught the train, 4 people both walked and took a train, and everyone who walked used another form of transport. No one from the group used all three forms of transport.

- 9 How many people only caught the bus?

- A 2
- B 4
- C 5
- D 8

Question 10 uses the following information.

The second, third and fourth odd placed numbers in a sequence of numbers are 18, 26 and 34.

- 10 If there are 8 numbers in this sequence, what is the sum of the whole sequence?

- A 192
- B 188
- C 184
- D 180

END OF TEST 09

Test 10

- Time Limit(Suggested Time) : 8 Minutes

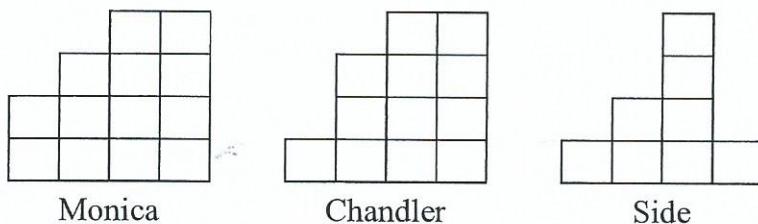
INSTRUCTIONS

1. Prior to commencing the test, students should develop a comprehensive knowledge in MATHEMATICS.
2. There are 10 multiple choice questions for each exam. The suggested time for each exam is 8(eight) minutes. Please be advised that this is a suggested time. The time may vary depending on the ability of the student.
3. There are 4 possible choices for each question, **A**, **B**, **C** or **D**. There is **ONLY 1** correct answer for each question. Please circle the most appropriate answer.
4. Make sure to spend an equal amount of time on each question. Try not to exceed an acceptable amount of time for each question.
5. Please avoid reading the solutions until each exam is complete. The exam is testing your ability under exam conditions, not an exercise you complete as homework. **ONLY** view the solutions after a reasonable attempt has been made.

- 1 The speed of the boat is 13 times more than the speed of the river flow. The boat travelled 63 km moving downstream. It took 2.5 hours. Find the boat speed and speed of the river flow.

- A 13 km/h, 1 km/h
B 15.5 km/h, 2.5 km/h
C 22.4 km/h, 1.6 km/h
D 23.4 km/h, 1.8 km/h

- 2 Two friends Chandler and Monica remember the front view of a 3D shape differently. The side view of the shape is given below.



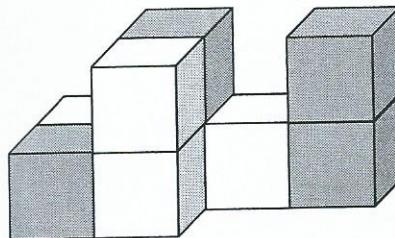
If the number of cubes in the shape is 16, whose memory of the shape could be correct?

- A Chandler only
B both
C Monica only
D none
- 3 $54 - [4^2 + (3 \times 15 - 7)] \div 6 =$

- A 48
B 0
C 6
D 45

- 4 The 8th of November in 2011 is a Tuesday. What day will it be in 7 years' time on the 8th of November?
- A Thursday
B Tuesday
C Friday
D Wednesday

- 5 The following shape is built out of cubic blocks.



How many fewer faces does the figure have after the shaded cubes are removed?

- A 18
- B 17
- C 15
- D 12

- 6 Which of the following fractions has the smallest value?

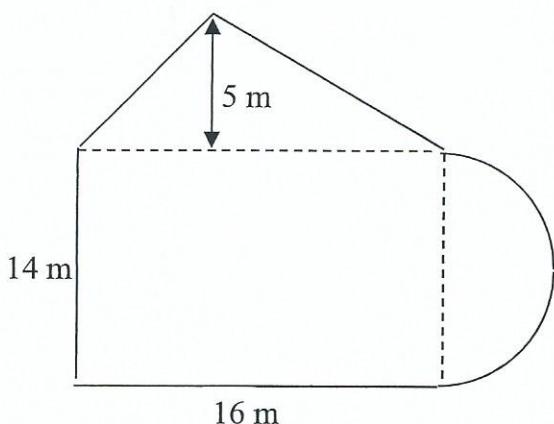
$$\frac{19996}{19999} \quad \frac{19987}{19990} \quad \frac{19995}{19998} \quad \frac{19992}{19995}$$

- A $\frac{19996}{19999}$
- B $\frac{19987}{19990}$
- C $\frac{19995}{19998}$
- D $\frac{19992}{19995}$

- 7 Topsey the Elf is helping Santa wrap presents for Christmas. She uses two strips of ribbon to wrap each present. She cuts the strips from one length of ribbon and she takes 3 seconds per cut. How long will it take Topsey to cut ribbons for 12 presents?

- A 72 seconds
- B 69 seconds
- C 60 seconds
- D 55 seconds

- 8 What is the area of this shape? (Use $\pi = \frac{22}{7}$)

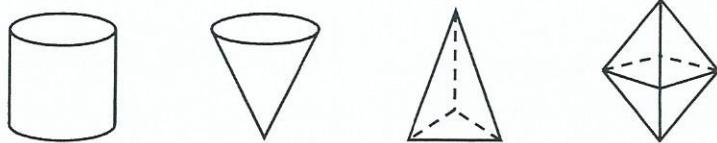


- A 418 m^2
- B 341 m^2
- C 308 m^2
- D 388 m^2

- 9 I am building a big cube out of 27 identical smaller cubes. I want to paint some of the smaller cubes completely red. What is the maximum number of smaller cubes I can paint so that no painted cubes are besides one another when the big cube is assembled?

- A 11
- B 12
- C 13
- D 14

- 10 Which of the following solids have an apex?



- A cylinder and cone
- B cone, triangular pyramid, octahedron
- C cone and triangular pyramid
- D cone and octahedron