



2002

HALF YEARLY EXAMINATION

MATHEMATICS

YEAR 9

Time allowed: 75 minutes

Instructions:

- There are FIVE (5) questions. Each question is of equal value.
- Attempt all questions.
- Show all necessary working. Marks may be deducted for badly arranged work.
- Start each question on a new page. Write on one side of the paper only.

Name: .....

QUESTION 1

- A rectangle has a perimeter of 44 cm and is 9 cm wide. What is its length?
- Between which two consecutive integers does  $\sqrt{17}$  lie?
- Write 7 620 000 in scientific notation.
- How far does a train travel in 20 minutes if it travels at 120 km/h?
- Simplify  $\frac{3a}{5} - \frac{a}{2}$
- Simplify  $3p - 2p^2 - 5p^2 - p$
- Complete the statement: The sum of the exterior angles of a polygon is....
- Change the subject of the formula to x:  $y=3x-2$
- Write using mathematical symbols the statement  
'the number three less than x is one third of x'
- The area of a rectangle is  $20 \text{ cm}^2$ . How wide is the rectangle if it is x cm long?
- Divide 1 litre in the ratio 5:3
- If  $x+5=9$ , find  $x^2-6$
- Simplify  $2(x-4)(x+2)$
- n)** A car is travelling at v kilometres per hour. Convert this to metres per second.
- Petrol prices rise from x cents/litre to y cents/litre. Before the rise it cost \$m to fill my car with petrol. What is the new cost of filling the car with petrol?

### QUESTION 2

- a) Find the size of the interior angle of a regular hexagon.
- b) Evaluate  $\frac{1}{a} - a^2$  given that  $a = \frac{2}{3}$ .
- c) Solve  $4 - 2x \leq 6$ , and graph the solution on the number line.
- d) Simplify
- i)  $\frac{ab}{c} + \frac{2a}{ab}$
- ii)  $\frac{4xy}{3p} \times \frac{9p}{x^2y} + \frac{5p}{2x}$
- e) For the table given below, find
- the common difference
  - the rule for the relationship

x	-1	1	3	5	7	9
y	3	-1	-5	-9	-13	-17

- f) Find the equation of a line with gradient  $-\frac{2}{5}$  and a y-intercept of 3
- g) Write the x and y intercepts of  $y = 4 - 2x$ .  
Hence draw a neat sketch of  $y = 4 - 2x$ .
- h) A bag contains jelly beans, of which 9 are red, 5 are green, and 3 are yellow.  
If one jelly bean is chosen at random, find the probability that it is green.

### QUESTION 3

- a) From a normal pack of 52 playing cards, a black card is randomly drawn out and kept aside. What is the probability that when a second card is next drawn at random from the pack, it is also black?
- b) Simplify
- $a^3 \times 4a^2c$
  - $24ab^2 + 4a^2b$
  - $(3x^2)^4$
- c) Evaluate, without a calculator and showing working,  $4x^{-\frac{1}{2}}$  when  $x = 9$ .
- d) Give the answer to the following in scientific notation, correct to 3 significant figures:
- $$\frac{7645 \times 9765}{(0.454)^4}$$
- e) The area of a semi circle is given by  $A = \frac{1}{2}\pi r^2$ . Change the subject of this formula to  $r$ .
- f) A trapezium is drawn with its parallel sides 5 cm apart. You are told that the area of the trapezium is  $30\text{cm}^2$ , and that the lengths of the parallel sides are integers (in cm). Find all the possible lengths that the parallel sides could be.

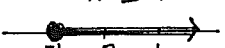
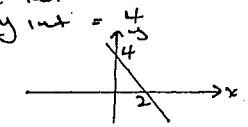
Find the reciprocal of  $\frac{1}{x} + \frac{1}{x}$ .

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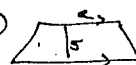
Question 1

- length =  $\frac{44 - 2 \times 9}{2}$  cm = 13 cm
- between 4 and 5
- $7.62 \times 10^6$
- dist =  $\frac{1}{3} \times 120$  km = 40 km
- $\frac{3a}{5} - \frac{a}{2} = \frac{6a - 5a}{10} = \frac{a}{10}$
- $3p - 2p^2 - 5p^2 - p = 2p - 7p^2$
- $360^\circ$
- $y = 3x - 2$   
 $\therefore x = \frac{y+2}{3}$
- $x - 3 = \frac{1}{3}x$
- width =  $\frac{20}{x}$  cm
- $\frac{5}{8} \times 1000$  mL = 625  
 $\frac{3}{8} \times 1000$  mL = 375  
625 : 375 (mL)
- $x + 5 = 9$   
 $x = 4$   
 $\therefore x^2 - 6 = 4^2 - 6 = 10$
- $2(x^2 - 2x - 8) = 2x^2 - 4x - 16$
- $v$  km/h =  $\frac{1000 \text{ m}}{60}$  min  
 $= \frac{1000}{60} \text{ m/min} = \frac{1000}{60 \times 60} \text{ m/s} = \frac{5}{18} \text{ m/s}$

Question 2

- a) ext  $L = \frac{360^\circ}{6} = 60^\circ$   
 $\therefore$  int  $L = 120^\circ$   
or  $2x + L = \frac{(6-2) \times 180}{6} = \frac{4 \times 180}{6} = 120^\circ$
- b)  $\frac{1}{2} - a^2 = \frac{1}{2} - \frac{4}{9}$   
 $= \frac{3}{2} - \frac{4}{9} = 1\frac{1}{18}$
- c)  $4 - 2x \leq 6$   
 $-2x \leq 2$   
 $\therefore x \geq -1$   

- d) i)  $\frac{ab}{c} + \frac{2a}{ab} = \frac{a^2b^2 + 2ac}{abc}$   
ii)  $\frac{4x}{3p} \times \frac{3x}{x} \times \frac{2x}{5x} = \frac{24}{5p}$
- e) com. diff = -2  
int:  $y = -2x + 1$
- f)  $y = -\frac{2}{5}x + 3$
- g)  $y = 4 - 2x$   
 $x$  int = 2  
 $y$  int = 4  

- h) no. of jelly beans = 17  
 $P(A) = \frac{5}{17}$
- i) no. of litres =  $\frac{100 \text{ m}}{x}$  (L)  
new cost =  $\frac{100 \text{ m}}{x} \times y$  cents  
 $= \frac{100y}{x}$

Question 3

- a)  $P(B) = \frac{12}{51}$  1
- b) i)  $4a^5c$  2  
ii)  $\frac{6b}{a}$  2  
iii)  $81\pi^6$  2
- c)  $4x^{-\frac{1}{2}} = \frac{4}{\sqrt{x}}$   
 $= \frac{4}{\sqrt{9}} = \frac{4}{3}$  3
- d)  $1.76 \times 10^9$  3
- e)  $A = \frac{1}{2} \pi r^2$   
 $2A = \pi r^2$   
 $\therefore r^2 = \frac{2A}{\pi}$   
 $r = \sqrt{\frac{2A}{\pi}}$  ( $r > 0$ ) 2
- f)   
 $A = \frac{5}{2}(a+b)$   
 $30 = \frac{5}{2}(a+b)$   
 $\therefore a+b = 12$   
possible values of  $a < b$  are:  
1, 11; 2, 10; 3, 9;  
4, 8; 5, 7; (6, 6) ?
- g)  $x + \frac{1}{x} = \frac{x^2+1}{x}$   
 $\therefore$  reciprocal =  $\frac{x}{x^2+1}$  2

Question 4

- a) begins with 1 or 2  
 $\therefore P = \frac{2}{5}$
- b)  $A = bh = 1.6 \times \frac{1}{2}$   
area =  $0.8 \text{ m}^2$
- ii)  $A = (94 \times 61) - \frac{1}{2} \pi 31^2$   
area =  $4224.46 \text{ mm}^2$   
(NB: radius =  $\frac{94 - 2 \times 16}{2} = 31$ )
- c)  $P = (1.6 + 0.76) \times 2$   
perim =  $4.72 \text{ m}$
- ii)  $P = 2 \times 61 + 94 + 2 \times 16 + \frac{1}{2} \times 2 \pi \times 31$   
circumf =  $345.39 \text{ mm}$
- d)  $3^{n+1} \div 3^{1-n} = 3^{n+1-(1-n)} = 3^{n+1-1+n} = 3^{2n}$
- e)  $\left(\frac{m^6}{16}\right)^{\frac{3}{2}} = \frac{m^9}{16^{\frac{3}{2}}} = \frac{m^9}{64}$
- d)  $\frac{u}{a} = \frac{u-a}{r}$   
 $ur = au - a^2$   
 $ur - au = -a^2$  A  
 $\therefore u(r-a) = -a^2$   
 $u = \frac{-a^2}{r-a}$

Question 5

- a)  $P(D) = \frac{13}{52}$   
 $P(P) = \frac{12}{52}$   
 $P(\text{either}) = \frac{13}{52} + \frac{12}{52} - \frac{3}{52} = \frac{22}{52}$  2
- b) i)  $\frac{x}{3} - 5x = 2$   
 $x - 15x = 6$   
 $\therefore -14x = 6$   
 $x = \frac{-6}{14} = \frac{-3}{7}$  2
- ii)  $\frac{x}{3} - 1 = \frac{2x-3}{2}$   
 $\frac{2x-6}{6} = \frac{6x-9}{6}$   
 $\therefore 2x-6 = 6x-9$   
 $3 = 4x$   
 $\therefore x = \frac{3}{4}$  2
- iii)  $10x - 5 - 12x - 3 = 12$   
 $-2x - 8 = 12$   
 $\therefore 2x = -20$   
 $x = -10$  2
- iv)  $2x - 4 \leq -2$   
 $2x \leq 2$   
 $x \leq 1$  2
- v)  $\frac{1-3x}{2} \geq 4$   
 $1-3x \geq 8$   
 $-3x \geq 7$   
 $\therefore x \leq \frac{-7}{3}$  4
- c) let Bill be  $x$  years old  
& Jack is  $(x+10)$  ..  
 $x+10+3 = 2(x+3)$   
 $x+13 = 2x+6$   
 $x = 7$  4  
 $\therefore$  Bill is 7 years old  
Jack is 17 years old