SCEGGS Darlinghurst

2015
Year 7
Semester 1 Examination

Mathematics

Outcomes Assessed
MA4-1WM, MA4-2WM, MA4-3WM, MA4-4NA, MA4-8NA, MA4-10NA, MA4-11NA, MA4-21SP

Name: ....

Teacher: ....

General Instructions
- Time allowed – 1 hour
- Calculators may not be used
- **Carefully** read the instructions at the beginning of each section
- Write your name at the top of each page
- Attempt **all** questions in spaces provided in the examination paper
- Show **all** your working
- You will need a pen, pencil, eraser and ruler

Question	Probability	Integers	Algebra & Equations	Number Plane	Challenge Problem	Marks
1 – 8	/3	/2	/2	/1		/8
9		/14	/1			/15
10	/4		/7	/3		/14
11			/11	/4		/15
12	/3		/7	/2	/2	/14
TOTAL	/10	/16	/28	/10	/2	/66

Section I – Multiple Choice

8 marks
Attempt Questions 1 – 8

Circle the correct response
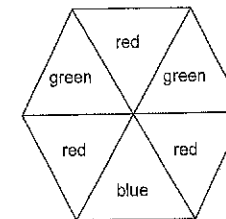Write your name at the top of each page.

1. On this spinner, what is the probability of spinning blue?

   (A) $\dfrac{1}{6}$

   (B) $\dfrac{1}{3}$

   (C) $\dfrac{1}{2}$

   (D) 1

2. A particular set of traffic lights shows red for 30 seconds, amber for 2 seconds and green for 2 minutes. The chance of getting a green light at this particular set of traffic lights is:

   (A) unlikely

   (B) even

   (C) likely

   (D) certain

3. A standard 6-sided die is rolled. What is the probability of rolling at least 5?

   (A) $\dfrac{1}{6}$

   (B) $\dfrac{2}{6}$

   (C) $\dfrac{4}{6}$

   (D) $\dfrac{5}{6}$

4   Which of the following statements is **not** true?

(A) $-3 < 5$

(B) $-3 > -5$

(C) $-5 < 3$

(D) $-5 > -3$

5   Mary has $70 in her bank account. After she withdraws $50 and then deposits $100, how much will Mary have in her bank account?

(A) $-$80

(B) $20

(C) $120

(D) $220

6   Simplify $3a - 4b + 2a + 10b$.

(A) $11ab$

(B) $5a - 14b$

(C) $5a + 6b$

(D) $5a^2 + 6b^2$

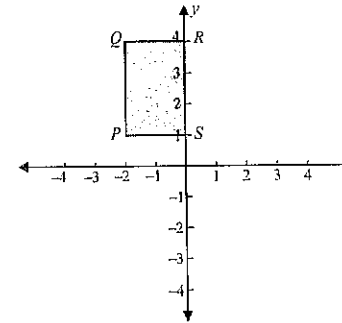7   The steps to simplify $5 \times 4a$ to $20a$ are:

$$5 \times 4a = 5 \times (4 \times a) = (5 \times 4) \times a = 20a$$

Which of the following laws was used?

(A)   Algebraic law

(B)   Associative law
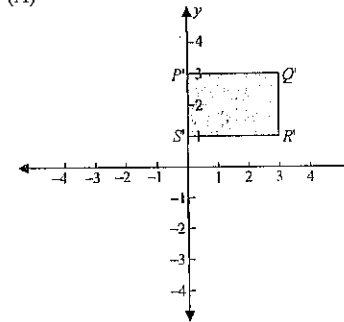
(C)   Commutative law

(D)   Distributive law

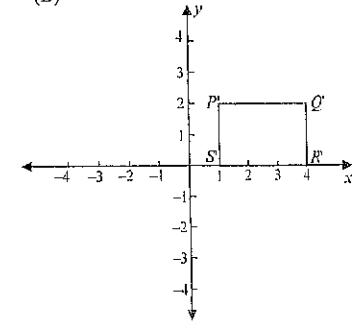8   The rectangle $PQRS$ is rotated $90°$ clockwise about the origin to create $P'Q'R'S'$.

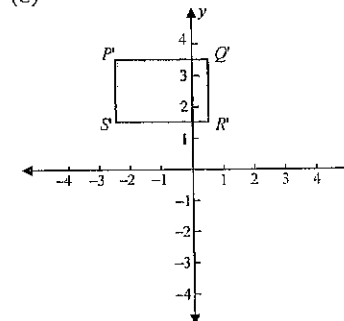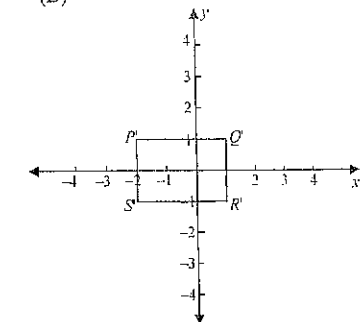Which of the diagrams below shows the correct position of $P'Q'R'S'$?

(A)

(B)

(C)

(D)

Section II

58 marks
Attempt Questions 9–12

Write your answers in the spaces provided in the examination paper.
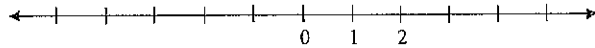Write your name at the top of each page.

Marks

Question 9 (15 marks)

(a)   Rewrite the following numbers in ascending order.   **1**

    10, 0, −1, 4, −3

(b)   (i)   Complete the numberline below.   **1**

    (ii)   Place a dot (•) on the numberline at −2 and a cross (×) on the numberline   **1**
            at 4.

    (iii)   What is the difference between 4 and −2?   **1**

(c)   State whether the following statements are true or false.

    (i) $10 - 3 = -3 + 10$ **1**

    (ii) $3^2 = 6$ **1**

Marks

Question 9 (continued)

(d)   The calculation on the right shows $\begin{array}{r} 21 \times \\ \underline{14} \\ 84 \\ \underline{210} \\ \underline{294} \end{array}$ **1**
       that $14 \times 21 = 294$.

    Show how 14×21 could be calculated using a different method.

(e)   Evaluate each of the following, showing clear working where necessary.

    (i) -5×7 **1**

    (ii) $-10 - 3$ **1**

    (iii) $-4 + 12 \div 2$ **2**
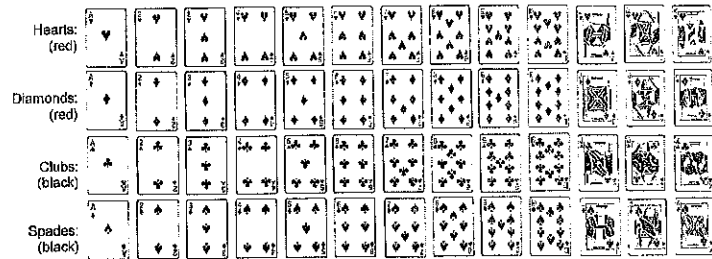
    (iv) $5 - (10 - 30)$ **2**

    (v) $\dfrac{1 - 5^2}{1 - 5}$ **2**

End of Question 9

Marks

Question 10 (14 marks)

(a) The 52 cards in a standard deck of playing cards are shown below, divided evenly into 4 suits: hearts, diamonds, clubs, spades.

The cards are shuffled and one is taken out at random.

(i) What is the probability of choosing

  (A) the ace of hearts?   1

  (B) a spade?   1

  (C) a picture card?   1

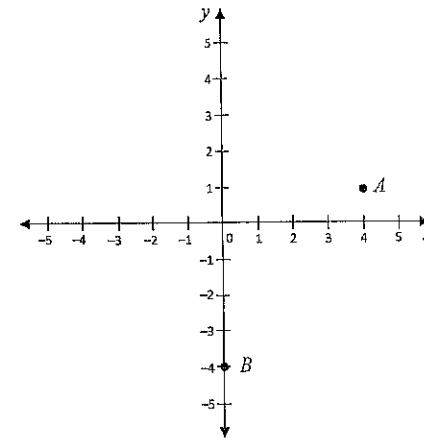(ii) What is the complementary event to choosing a red card?   1

Question 10 continues on the next page

Marks

Question 10 (continued)

(b)

(i) Write down the coordinates of the points A and B plotted on the number plane above.   2

(ii) Plot the point $C(-2, 1)$ on the number plane above.   1

(c) Given $x = 2$, $y = 10$ and $z = -5$ evaluate

(i) xy 1

(ii) $\dfrac{y}{z}$ 1

(iii) $3z^2$ 1

Question 10 continues on the next page

Marks

Question 10 (continued)

(d)   Simplify the following algebraic expressions.

    (i) $3x + 6x$ 1

    (ii) $3x - 6x$ 1

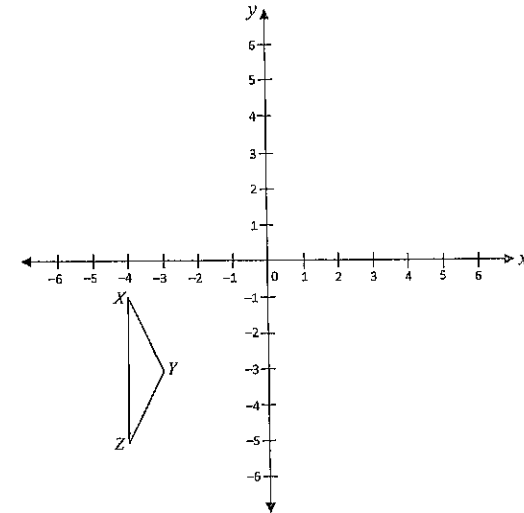   (iii) $3x \times 6x$ 1

    (iv) $\dfrac{6x}{3x}$ 1

End of Question 10

Marks

Question 11 (15 marks)

(a)

The transformation of triangle XYZ to $X'Y'Z'$ is described as follows:

$$X(-4, -1) \longrightarrow X'(4, -1)$$
$$Y(-3, -3) \longrightarrow Y'(3, -3)$$
$$Z(-4, -5) \longrightarrow Z'(4, -5)$$

    (i)   Draw and label $X'Y'Z'$ on the number plane above.   1

    (ii)   In which quadrant does $X'Y'Z'$ lie?   1

    (iii)   Write a sentence to accurately describe the transformation.   2

Question 11 continues on the next page

Marks

Question 11 (continued)

(b)   Solve the following equations for x.

(i) $x + 5 = 20$ 1

(ii) $\dfrac{x}{3} = 12$ 1

(iii) $2x - 5 = 13$ 2

(iv) $\dfrac{x+1}{2} = -5$ 2

Marks

Question 11 (continued)

(c)   Anna's teacher has given her the following challenging equation to solve: 2
$$3x - 10 = \frac{x}{2} + 5 .$$
Anna thinks the solution is $x = 6$.

Show that she is correct by substituting $x = 6$ into both sides of the equation.
Show your working clearly in the space below.

(d)   Write an algebraic expression for each of the following

(i)   5 more than n.   1

(ii)   The sum of m and n.   1

(iii)   The number of players in a netball competition if there are n teams   1
with 7 players on each team.

End of Question 11

Marks

Question 12 (14 marks)

(a)   An online shop sells candles for $2 each plus shipping, which is a fixed cost of $10.

    (i)   How much does it cost to buy 8 candles (including shipping)?   1

    (ii)   Write an expression for the cost of n candles (including shipping).   1

    (iii) How many candles can be bought for $70 (including shipping)?   1

(b)   I think of a number, increase it by 2, multiply this by 5 and then divide by 4 to get a result of 15.

    (i)   Write the statement above as an equation where n is the number.   1

    (ii)   Find the number n.   1

Question 12 continues on the next page

Marks

Question 12 (continued)

(c)   A triangle UVW is **translated** to $U'V'W'$.   2
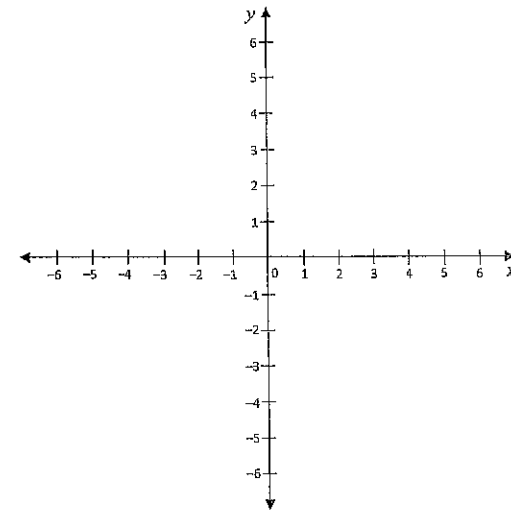
Fill in the missing coordinates below to fully describe the translation.

$$U(3,-2) \longrightarrow U'(-2,0)$$
$$V(5,0) \longrightarrow V'(\quad,\quad)$$
$$W(\quad,\quad) \longrightarrow W'(-2,5)$$

(You may use the blank number plane below to help solve the problem).

Question 12 continues on the next page

Question 12 (continued)

(d)   A pair of dice was rolled 50 times. The sum of the numbers showing on the faces
        was calculated each time. The results are shown in the table below.

Sum	2	3	4	5	6	7	8	9	10	11	12
Number of times rolled	0	2	4	6	5	8	9	6	5	2	3

(i)   Write down the sample space of this probability experiment.   1

(ii)   Which sum appears to be most likely?   1

(iii)   A sum of 2 appears to be less likely than a sum of 12. For a standard   1
        pair of dice, why should this theoretically not be the case?

(e)   Mary invents a new mathematical operation ☺:
        $$a \ ☺ \ b \ = \ 2a - b + 1.$$
(i)   Find $3 ☺ 5$.   1

(ii)   Give a clear example to show that ☺ is not commutative.   1

Question 12 continues on the next page

Question 12 (continued)

(f)   A sorting program does not understand about numbers. It treats all digits
        (0, 1, 2, ... , 9) as though they are letters in an alphabet and sorts lists of
        numbers "alphabetically" rather than "numerically". For example the program
        sorts the list of numbers 0, 1, 2, 10, 12, 21, 101, 111, 200 in this order:

        0, 1, 10, 101, 111, 12, 2, 200, 21

(i)   If the numbers 1, 2, ... , 99 are sorted, what is the 45th number?   1

(ii)   If the numbers 1, 2, ... , 200 are sorted, what is the 195th number?   1

End of paper

SCEGGS 2015 Year 7 semester 1
Examination (SAMPLE SOLUTIONS)

1. BLUE PROBABILITY $= \frac{1}{6}$
= (A)

2. 2 mins out of 2mins 32 sec
= $\frac{120 \text{ seconds}}{152 \text{ seconds}}$
= likely = (C)

3. Probability of at least 5 =
Probability of 5 OR probability of 6
= $\frac{2}{6} = \frac{1}{3}$ = (B)

4. (D) $-5 > -3$.
-5 is not greater than -3

5. $7b - 5b + 100$
= 120
= (C)

6. $3a - 7b + 2a + 10b$
= $5a + 6b$ = (C)

7. (D)

8. Rotation of
90° clockwise
= (B)

e) i) -5×7
= -35

ii) $-10 - 5 = -15$

iii) $-4 + 12 \div 2$ (BODMAS)
= $-4 + 6$
= 2

iv) $5 - (10-30)$
$5 - (-20)$
= 25

v) $\frac{1-5^2}{1-5}$
= $\frac{1-25}{1-5} = \frac{-24}{-4}$
= 6

9a) $-3, -1, 0, 4, 10$

b)f [number line] ...-3 -2 -1 0 1 2 3 4...

iii) 6.

c)i) $10 - 5 = -5 + 10$
TRUE

ii) $3^2 \geq 6$
FALSE

d) $14 \times 21 =$
$10 \times 21 + (4 \times 21)$
= $210 + 84$
= 294

ii) $\frac{(n+2)5}{4} = 15$

$(n+2)5 = 60$

$(n+2) = 12$

$n = 12 - 2 = 10$

12. c) translation is

X Axis -5

Y Axis +2.

$U(3,-2) \rightarrow U'(-2,0)$

$V(5,0) \rightarrow V'(0,2)$

$W(3,3) \rightarrow W'(-2,5)$

d) $S = \{2,3,4,5,6,7,8,9,10,11,12\}$

ii) 8 appears the most likely because it corresponds to the most number of times rolled.

iii) a sum of 2 = rolling 2 x 1's

chance $= \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

a sum of 12 = rolling 2 x 6's

is equally likely at

$\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

Theoretically, they should be equally as unlikely.

e. $a \odot b = 2a - b + 1$

i) $3 \odot 5 = 2(3) - 5 + 1$

$= 6 - 5 + 1 = 2$

ii) $a \odot b \neq b \odot a$

$a \odot b = 2a - b + 1$

$b \odot a = 2b - a + 1$

If they are commutative

$2a - b + 1 = 2b - a + 1$

ie $3a = 3b$

this law is only true if $a = b$

∴ the operation is not commutative.

12. in order

1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19.   11

2, 20, 21 ......

3 30 31 32 33 34 35 36 37 38 39.   22

49.   44   33

5

45th number is '51

ii) working backwards

99, 98, 97, 96, 95, 94

94 is 195th number