SYDNEY
BOYS
HIGH
SCHOOL

2020

YEAR 10 STAGE 5.3
TERM 2
HALF YEARLY
ASSESSMENT

Year 10 Stage 5.3 Half Yearly

General Instructions

- Reading time – 5 minutes
- Working time – 55 minutes
- Write using black pen
- NESA approved calculators may be used
- For multiple choice, circle the letter of your chosen answer.
- Leave your answers in the simplest exact form, unless otherwise stated
- All working and answers are to be written in this test booklet.
- Marks may **NOT** be awarded for messy or badly arranged work

Name	
Class	

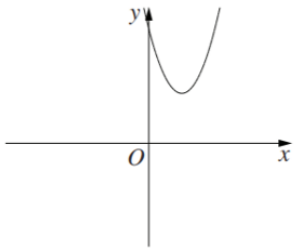
Section 1 Mark

Examiner: *S.G.*

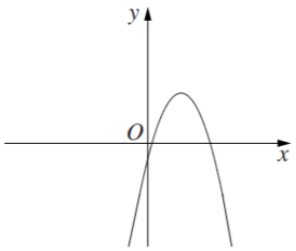
Section 1

1. Which diagram best shows the graph of the parabola $y = 3 - (x-2)^2$? **1**

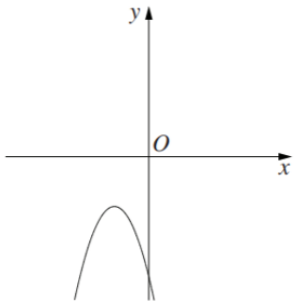
(A)



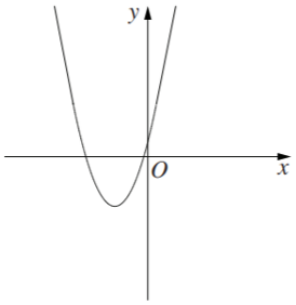
(B)



(C)



(D)



2. Write $\frac{1}{b+2} + \frac{1}{b-2}$ as a single simplified fraction. **1**

3. Rationalise the denominator of:

i) $\frac{2+\sqrt{5}}{\sqrt{3}}$ **1**

ii) $\frac{7}{\sqrt{14}-2}$ **1**

4. Find the point of intersection of the lines $y = 2x - 1$ and $10x + 14y - 43 = 0$ **2**

5.

i) Factorise $a^2 + 11a + 28$ **1**

ii) Hence solve $a^2 + 11a + 28 = 0$ **1**

5. Calculate the final value if \$10,000 is invested at an interest rate of 4.5% p.a. compounded quarterly for 5 years. **2**

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Section 2

Section 2

1. Which equation represents the line perpendicular to $2x-3y=8$, passing through the point $(2,0)$? **1**

   (A) $3x+2y=4$
   (B) $3x+2y=6$
   (C) $3x-2y=-4$
   (D) $3x-2y=-6$

2. If A is inversely proportional to B, and $A = 10$ when $B = 2$, find:

a) the formula connecting A and B. **1**

b) the value of B when $A = 0.5$. **1**

3. Use the quadratic formula to solve $7y^2-y-2=0$, giving your answers correct to two decimal places. **2**

4. Solve the following linear equation, leaving your answer in the form **2**

$x = a + b\sqrt{10}$, where a and b are integers.

$$3x = \sqrt{10}\,x - 4$$

5. Calculate the perimeter of the following shapes.

i) A square with diagonal 15cm. **1**

ii) A semicircle with area 8π cm^2. **2**

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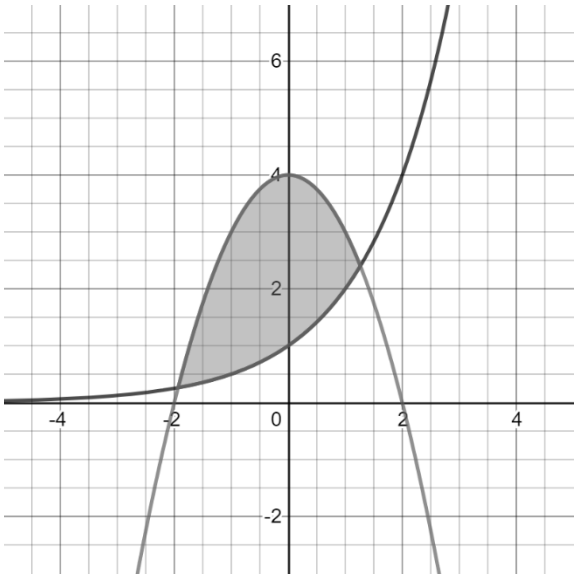
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Section 3

Section 3

1. A region enclosed by the curves $y = 2^x$ and $y = 4 - x^2$ is shaded in the diagram below. **1**



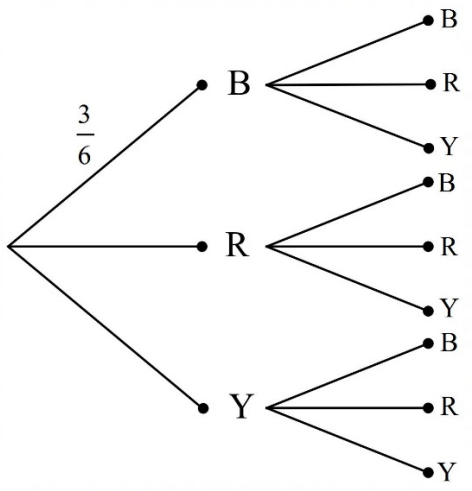
Which of the following defines the shaded region?

(A) $y \leq 2^x$ and $y \leq 4 - x^2$
(B) $y \leq 2^x$ and $y \geq 4 - x^2$
(C) $y \geq 2^x$ and $y \leq 4 - x^2$
(D) $y \geq 2^x$ and $y \geq 4 - x^2$

2. What is the required annual interest rate, as a percentage to 1 decimal place, required to grow \$23,456 into \$34,567 if compounded yearly for 7 years? **2**

3. Two marbles are drawn, without replacement, from an opaque bag containing 3 blue marbles, 2 red marbles and 1 yellow marble.

A partially completed probability tree is shown. (You do not need to complete it.)



Find the probability that:

i) the first marble drawn is red. **1**

ii) a blue marble and a yellow marble are drawn. **1**

iii) The two marbles are different colours. **1**

Section 3 is continued overleaf

4.

i) Write $x^2+12x+19$ in the form $(x+a)^2-b$, where a and b are positive integers. **1**

ii) Hence solve $x^2+12x+19=0$. **1**

5. Find the equation of the line that passes through both $(4,-5)$ and $(-3,-1)$, expressing your answer in either gradient-intercept form or general form. **2**

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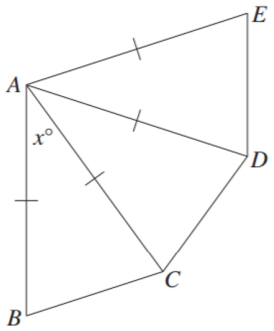
Half Yearly

Section 4

Section 4

1. The triangle ABC is isosceles with $AB = AC$ and the size of $\angle BAC$ is $x°$.

   Points D and E are chosen so that ΔABC, ΔACD and ΔADE are congruent, as shown in the diagram.



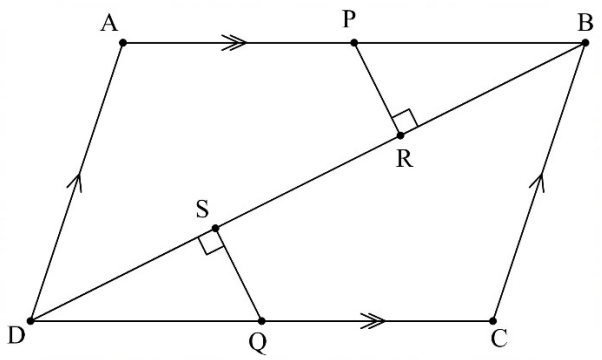
   Find the value of x for which AB is parallel to ED, giving reasons. **3**

2. Find all of the values of x that are solutions to **3**

$$\left(x+\frac{6}{x}\right)^2 - 12\left(x+\frac{6}{x}\right) + 35 = 0.$$

3. In the diagram below, $ABCD$ is a parallelogram and P, Q are the midpoints of the sides AB, DC respectively.

   The intervals PR and QS are drawn perpendicular to the diagonal DB.



i) Prove that ΔBPR and ΔDQS are congruent. **2**

ii) If $AB = 10\,\text{cm}$, $PR = 3\,\text{cm}$ and $BD = 14\,\text{cm}$, find the length of SR. **2**

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Section 5

Section 5

1. Which of the following is an example of direct proportion? **1**

   (A) Value of an item in US$ and Value of an item in AU$.

   (B) Height of a person and Weight of a person.

   (C) Compound interest earned on savings and Interest rate.

   (D) Surface area of a cube and Volume of a cube.

2. The table below shows the monthly payments for a loan of $1000 for varying interest rates, where interest is compounded monthly.

Interest rate	Period of loan		
	10 years	15 years	20 years
7% p.a.	$11.61	$9.00	$7.75
8% p.a.	$12.13	$9.56	$8.36
9% p.a.	$12.67	$10.14	$9.00
10% p.a.	$13.22	$10.75	$9.65

Nora is planning to borrow $650,000 to buy an apartment at 10% p.a. over a period of 15 years.

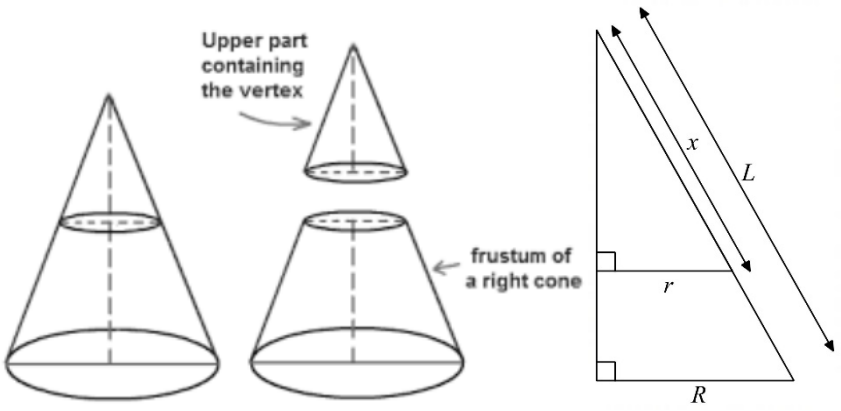
a) Show that the total interest Nora pays is $607,750. **2**

b) Ella borrows $3,000 to buy a 4K television. Her loan has an interest rate of 16% p.a., with interest compounded twice a month. She makes equal repayments M twice a month, for 10 years, at which point the loan is paid off.

Use the table above to work out M. **1**

3. A right pyramid made from wood, has radius R and slant height L.

A shorter pyramid is cut from the top, with a slant height of x and radius r.



i) Explain why $r = \dfrac{Rx}{L}$. **1**

ii) The slant height x is chosen so that the upper part, containing the vertex, and the frustum of a right cone each have the same surface area. **3**

Show that $x = \sqrt{\dfrac{L}{2}(L+R)}$.

iii) Hence explain why $\dfrac{1}{\sqrt{2}} < \dfrac{x}{L} < 1$. **2**

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