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Student Number

Year 11, 2021 Mathematics Advanced Assessment Task 1 (25 Marks)

In-class Component:

Algebra, Surds,

Functions and Transformations, Trigonometry

30 minutes

Period 2, 4

THURSDAY 25th MARCH

KJL ESP AXD GDH WMD JZT

ALY* LMD PCB HYB RAS

225 copies

General

Instructions:

- Working time - 30 minutes
- Write using black pen
- NESA approved calculators may be used
- Diagrams are not to scale
- A reference sheet is provided separately

Section I - 15 marks

- Attempt Questions 1 - 2

Section II - 10 marks Multiple Choice

- Attempt Questions 3 - 12

Total 25 marks

Section I - 15 marks

Attempt Questions 1 - 2

1. Consider the function $f(x) = 2x^2 - 8x + 5$

(i) Give the y-intercept.

1 mark

(ii) Use the discriminant to show that $f(x)$ has two x -intercepts.

2 marks

(iii) State, in simplest exact form, the x -intercepts.

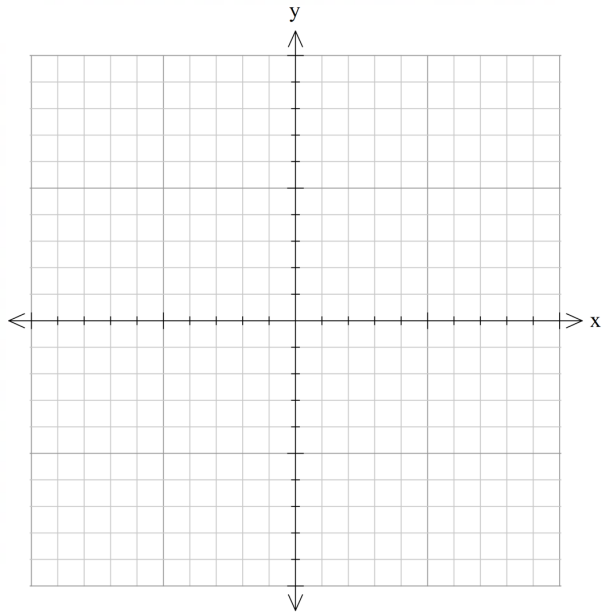
2 marks

(iv) Give the coordinates of the vertex.

2 marks

(v) Graph $y = f(x)$ showing all features calculated above.

2 marks



(vi) Find algebraically any points of intersection between $f(x) = 2x^2 - 8x + 5$ and the line $y = 8 - 13x$.

3 marks

(vii) Find the equation of the reflection of $f(x)$ in the y -axis.

1 mark

2. Find an equivalent, simplified expression without absolute value signs for $|x - 2| + 6$, given $x < 2$.

2 marks

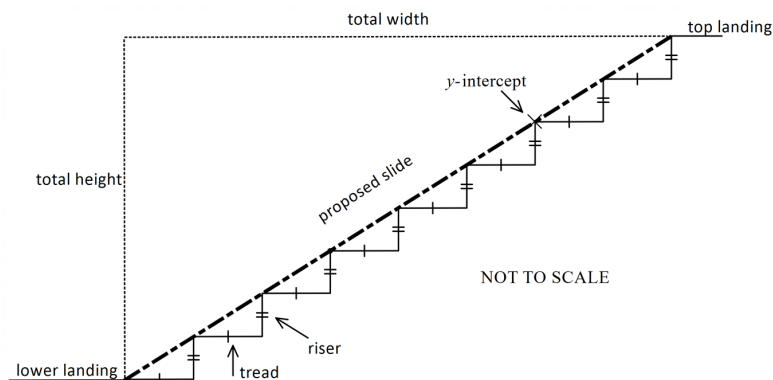
End of Section I

Section II - 10 marks

Attempt Questions 3 – 12 and circle the most correct answer

Questions 3 – 4 refer to the following information.

A proposal for a slide on the bleachers in Rosewood is presented. The tread of one step is 80cm, the riser is 60 cm, and there are 8 steps.



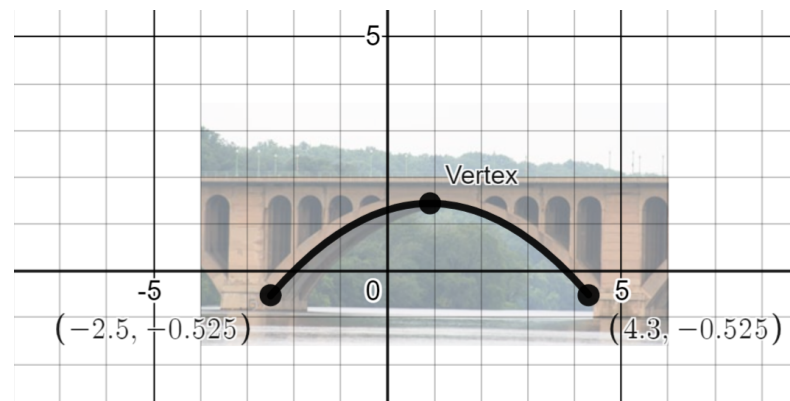
3. What is the acute angle of inclination of the slide to the horizontal. Answer correct to the nearest degree.

- A 53° B 49°
C 41° D 37°

4. What is the equation of the slide (in metres)? Assume the y -intercept for your equation is at the **top of the 6th step**, as shown on the diagram, and the x -axis is the lower landing.

- A $y = \frac{4x}{3} + 4.8$ B $y = \frac{3x}{4} + 4.8$
C $y = \frac{4}{3}x + 3.6$ D $y = \frac{3}{4}x + 3.6$

5. In the image below a section of a parabola has been modelled to match the curve of a bridge. The numbers that follow are all rounded to some extent. The endpoints of the curve are $(-2.5, -0.525)$ and $(4.3, -0.525)$. The equation of the curve is $y = -0.17(x - 0.91)^2 + 1.44$.



State the domain and range of the section of parabola shown.

- A Domain: $(-2.5, 4.3)$ B Domain: $[-0.525, 1.44]$
Range: $(-0.525, 1.44)$ Range: $[-2.5, 4.3]$
C Domain: $[-2.5, 4.3]$ D Domain: $(-0.525, 1.44)$
Range: $[-0.525, 1.44]$ Range: $(-2.5, 4.3)$

6. The equation of the axis of symmetry for the parabola in Question 5 is:

- A $x = 1.44$ B $y = 1.44$
C $x = 0.91$ D $y = 0.91$

7. The x coordinate/s of the x -intercept/s of the parabola in Question 5 are:

- A $\pm \sqrt{\frac{1.44}{0.17}} - 0.91$ B $\pm \sqrt{\frac{1.44}{0.17}} + 0.91$
C There are no x -intercepts D 1.44

8. What is the solution to $|7x - 5| = 4$?

- A $x = \frac{1}{7}$ or $x = \frac{9}{7}$ B $x = \frac{-9}{7}$ or $x = \frac{9}{7}$
 C $x = \frac{-9}{7}$ or $x = \frac{-1}{7}$ D $x = \frac{-1}{7}$ or $x = \frac{1}{7}$

9. What is the y-intercept of the parabola $y = 3(x + 2)^2 - 8$?

- A (0, 8) B (0, -4)
 C (0, -8) D (0, 4)

10. Let $f(x)$ and $g(x)$ be functions such that:

$$f(4) = 5, f(6) = 3, g(5) = 6, g(4) = 6, g(3) = 2.$$

What is the value of $f(g(4))$?

- A 2 B 3
 C 4 D 6

11. Which statement is true for the relation $(x - 6)^2 + (y + 4)^2 = 25$?

- A It has two x-intercepts and no y-intercepts B It has no x-intercepts and two y-intercepts
 C It has no x-intercepts and no y-intercepts D It has two x-intercepts and two y-intercepts

12. The equation of a polynomial with x-intercepts 3, -1 and -5 that also goes through the point $(-2, -30)$ could be:

- A $y = -2(x + 3)(x - 1)(x - 5)$ B $y = -2(x - 3)(x + 1)(x + 5)$
 C $y = 2(x + 3)(x - 1)(x - 5)$ D $y = 2(x - 3)(x + 1)(x + 5)$

End of Assessment

Advanced In class 2021 Task 1

① $f(x) = 2x^2 - 8x + 5$

(i) y-int = 5 or (0, 5)

(ii) $\Delta = (-8)^2 - 4(2)(5)$
 $= 24 > 0$

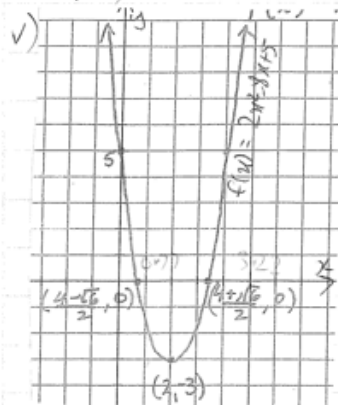
$\therefore 2$ x-intercepts

(iv) $x = \frac{8 \pm \sqrt{24}}{4}$
 $= 2 \pm \frac{\sqrt{6}}{2}$
 $= 2 \pm \frac{\sqrt{6}}{2}$

(iv) Vertex at $x = 2$

$$f(2) = 2(2)^2 - 8(2) + 5 = -3$$

V (2, -3)



(vi) $2x^2 - 8x + 5 = 8 - 13x$

$$2x^2 + 5x - 3 = 0$$

$$(2x - 1)(x + 3) = 0$$

$$\therefore x = \frac{1}{2} \text{ or } x = -3$$

$$\therefore y = \frac{3}{2} \text{ or } 47$$

pts $(\frac{1}{2}, \frac{3}{2})$ or $(-3, 47)$

(vii) $x \rightarrow -x$ $f(-x) = 2(-x)^2 - 8(-x) + 5$
 $= 2x^2 + 8x + 5$

② If $x < 2$, $x - 2 < 0$

$$\therefore |x - 2| = -(x - 2) = -x + 2$$

$$\therefore |x - 2| + 6 = -x + 2 + 6$$

$$= -x + 8, \text{ if } x < 2$$

③ $\theta = \tan^{-1}(\frac{60}{80}) = 37^\circ$

④

④ y-int = $6 \times 60 = 36$
 $m = \frac{3}{4} \therefore y = \frac{3}{4}x + 3 \cdot 6$

⑤ $[-2.5, 4.3]$ domain

$[-0.525, 1.40]$ range

⑥ $\square$ axis through vertex

$$x = 0.91$$

⑦ $\square$ by quadratic formula

Solve $y = -0.17(x - 0.91)^2 + 1.44$

$$-0.17(x - 0.91)^2 = 1.44$$

$$(x - 0.91)^2 = \frac{1.44}{0.17}$$

$$\therefore x = \pm \sqrt{\frac{1.44}{0.17}} + 0.91$$

⑧ $(7x - 5) = 4$ or $(7x - 5) = -4$

$$7x - 5 = 4$$

$$7x = 9$$

$$x = \frac{9}{7}$$

$$7x - 5 = -4$$

$$7x = 1$$

$$x = \frac{1}{7}$$

⑨ expanding: $3(x^2 + 4x + 4) - 8$

$$= 3x^2 + 12x + 12 - 8$$

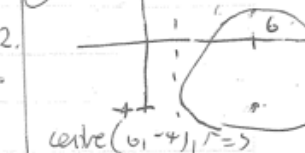
$$= 3x^2 + 12x + 4$$

$$\therefore y\text{-int } (0, 4) \text{ D.}$$

⑩ $g(4) = 6 \therefore f(g(4)) = f(6)$

$$= 3. \text{ B}$$

⑪



⑫ $y = a(x - 3)(x + 1)(x + 5)$

Subst $(-2, -30)$

$$-30 = a(-2 - 3)(-2 + 1)(-2 + 5)$$

$$-30 = a(-5)(-1)(3)$$

$$-30 = 15a$$

$$-2 = a$$

$$-30 = 15a$$

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