nelsonnet

Name: ____________________

PRACTICE EXAM

Year 11 Maths Methods Exam 1 Solutions

SECTION 1

- 26 multiple choice questions (26 marks)

1 $x^3 - 3x^2 - 4x + 12 = x^2(x - 3) - 4(x - 3)$

$= (x - 3)(x^2 - 4)$

$= (x - 3)(x - 2)(x + 2)$ **C**

2 $(x - 2)(x + 3)(3x + 1) = 3x^3 + ax^2 - 17x - 6$

Compare the leading term and the constant.

$(x - 2)(x + 3)(3x + 1) = 3x^3 + ax^2 - 17x - 6$

Using CAS expand $(x - 2)(x + 3)(3x + 1) = 3x^3 + 4x^2 - 17x - 6$

$a = 4$ **A**

3 $P(1) = P(2) = P(3) = P(6) = \frac{1}{5}$ and $P(4) = 2P(5)$.

Let $P(5) = a$

$4 \times \frac{1}{5} + 2a + a = 1$

$\frac{4}{5} + 3a = 1$

$3a = \frac{1}{5}$

$a = \frac{1}{15}$ therefore $P(4) = 2a = \frac{2}{15}$ **D**

4 $P(\text{Maths or Chemistry}) = P(\text{Maths}) + P(\text{Chemistry}) - P(\text{Maths and Chemistry})$

$\frac{9}{10} = \frac{5}{10} + \frac{6}{10} - P(\text{Maths and Chemistry})$

$P(\text{Maths and Chemistry}) = \frac{2}{10} = \frac{1}{5}$ **B**

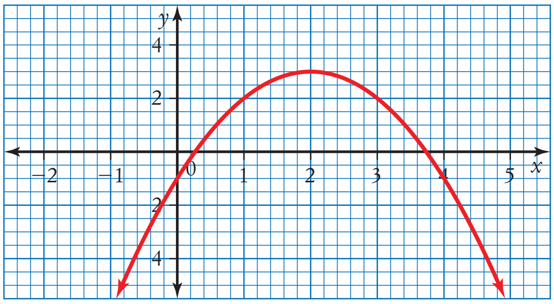
5 gradient $= \frac{2}{3}$ and y-intercept $= 2$

$y = \frac{2}{3}x + 2$

$3y = 2x + 6$

$2x - 3y + 6 = 0$ **B**

6 $y = -(x - 2)^2 + 3$ **A**



domain $= R$, range $= y \le 3$

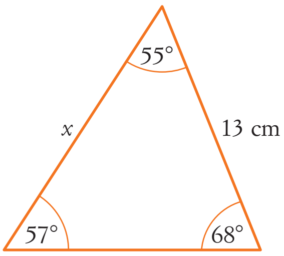
7 $x^2 + 6x + y^2 - 2y - 6 = 0$

$x^2 + 6x + 9 + y^2 - 2y + 1 = 6 + 9 + 1$

$(x + 3)^2 + (y - 1)^2 = 16$

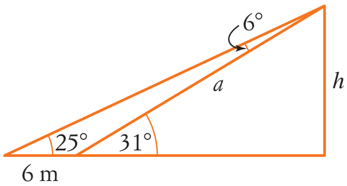
Centre $(-3, 1)$ and radius $= 4$ **E**

8



$$\frac{x}{\sin(68°)} = \frac{13}{\sin(57°)}$$ **B**

9



$$\frac{a}{\sin(25°)} = \frac{6}{\sin(6°)}$$

$a = 24.259$

$$\sin(31°) = \frac{h}{24.259}$$

$h = 12.49$ m **C**

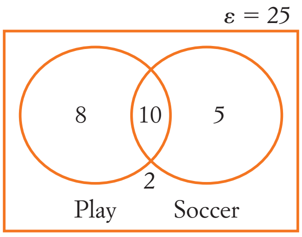
$a = 24.259$

10 $58.9 \times \frac{\pi}{180°} \approx 1.028$ **E**

11 After 3 white flesh nectarines are drawn, there are 5 yellow and 5 white flesh nectarines.

$P(\text{4th white given 1st 3 white}) = \frac{5}{10} = \frac{1}{2}$ **C**

12



$P(\text{soccer given in the play}) = \frac{10}{18} = \frac{5}{9}$ **A**

13 $y = -5\cos\left(\frac{\pi x}{3}\right)$ period $= \frac{2\pi}{\frac{\pi}{3}} = 6$, amplitude $= 5$ **E**

14 $\cos(a + b) = \cos(a)\cos(b) - \sin(a)\sin(b)$ **D**

15 When $x = 1, y = 3$ and when $x = 3, y = 2 \times 9 + 27 = 45$

$f(x) = 2x^2 + x^3$ average rate of change between (1, 3) and (3, 45)

$= \frac{\triangle y}{\triangle x} = \frac{45 - 3}{3 - 1} = 21$ **E**

16 $t_1 = 5, t_n = 2t_{n-1} + 1$

$t_1 = 5, \quad t_2 = 2 \times 5 + 1 = 11$

$t_2 = 11, \quad t_3 = 2 \times 11 + 1 = 23$

$t_3 = 23, \quad t_4 = 2 \times 23 + 1 = 47$ **A**

17 6, 12, 24, … 3072

$a = 6, r = 2 \qquad 6 \times 2^{n-1} = 3072$

$2^{n-1} = 512$

$(n - 1) = 9$

$n = 10$ **C**

18 $f(x) = 5x^2 - x + 2, \qquad f'(x) = 10x - 1$

$f'(1) = 9$ **E**

19 $\int 3(x + 3)^2\, dx \quad = \int (3x^2 + 18x + 27)\, dx$

$= x^3 + 9x^2 + 27x + c$ **C**

20 $2^{x+2} - 512 = 0$

$2^{x+2} = 512$

$2^{x+2} = 2^9$

$x + 2 = 9$

$x = 7$ **A**

21 $9^x - 10(3^x) + 9 = 0$

$3^{2x} - 10(3^x) + 9 = 0 \qquad a = 3^x$

$a^2 - 10a + 9 = 0$

$(a - 9)(a - 1) = 0$

$a = 9, \qquad a = 1$

$3^x = 9, \qquad 3^x = 1$

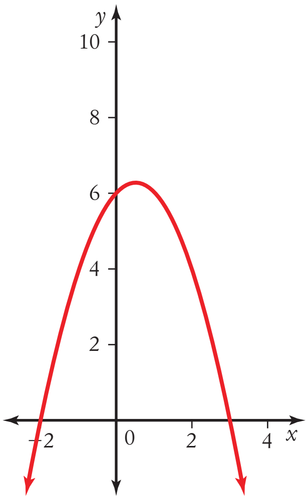
$3^x = 3^2, \qquad 3^x = 3^0$

$x = \{0, 2\}$ **D**

22 The gradient function is shown.

Stationary points at $x = -2, \qquad x = 3$

	$x < -2$	$x = -2$	$-2 < x < 3$
gradient	negative	zero	positive



Minimum at $x = -2$

	$-2 < x < 3$	$x = 3$	$x > 3$
gradient	positive	zero	negative

Maximum at $x = 3$ **B**

23 displacement $\qquad x = t^2 + 2t - 3$

Velocity $\qquad \dfrac{dx}{dt} = 2t + 2$ when $t = 0$ velocity $= 2$ cm/s **E**

24 $f(x) = x^2 + x$ has a gradient of -3

Gradient $f'(x) = 2x + 1$

$2x + 1 = -3$

$2x = -4$

$x = -2$

$f(-2) = (-2)^2 - 2 = 2$

Point $(-2, 2)$ **B**

25 function $f(x) = 3x^2$

$$\text{gradient of the secant} = \frac{f(x+h) - f(x)}{h}$$

$$= \frac{3(x+h)^2 - 3x^2}{h}$$

$$= \frac{3x^2 + 6xh + 3h^2 - 3x^2}{h}$$

$$= \frac{6xh + 3h^2}{h}$$

C

26 $$\lim_{x \to 1}\left(\frac{x^2 - 1}{x^2 + x - 2}\right)$$

$$= \lim_{x \to 1}\left(\frac{(x+1)(x-1)}{(x+2)(x-1)}\right)$$

$$= \lim_{x \to 1}\left(\frac{(x+1)}{(x+2)}\right)$$

$$= \frac{2}{3}$$

A