Name: _____

PRACTICE EXAM

Year 11 Mathematical Methods Exam 2

- Time allowed: 60 minutes
- Technology-free exam
- 18 short answer questions (36 marks)

1 The surface area of a sphere is given by the formula $A = 4\pi r^2$.

   a Transpose the equation to make r the subject.

   b Find the exact value of r if $A = 24\pi$ cm^2.

2 Factorise:

   a $12a^3b^2 - 18a^2b$

   b $am - 5m - 2bm + 10b$

   c $49 - x^2$

   d $x^2 - 7x - 18$

   e $x^3 - 3x^2 - 4x + 12$

3 Two six sided dice numbered have faces numbered 1, 2, 3, 4, 5 and 6. The dice are rolled and the outcomes are noted.

   A represents obtaining a total of 7 and B represents obtaining a 2 on one of the dice. Illustrate this with a grid and then find:

   a $P(A)$

   b $P(B)$

   c $P(A \text{ and } B)$

   d $P(A \text{ or } B)$

4 Find the equations of the lines:

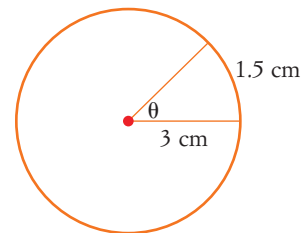   **a** passing through the points (1, 2) and (3, 10).

   b passing through the point $(-3, -5)$ and parallel to the line $3x - y + 4 = 0$.

5 **a** Write the quadratic function $f(x) = x^2 + 8x - 3$ in the form $f(x) = a(x + b)^2 + c$.

   b Hence find the equation of the axis of symmetry and the coordinates of the turning point.

6 In a circle with a radius of 3 cm an arc of length 1.5 subtends and angle of θ at the centre. Find:

   a the angle θ in radians.

   b the area of the sector.

7 A coin tray contains 3 five cent coins, 3 ten cent coins and 4 twenty cent coins. If two coins are selected find the probability that:
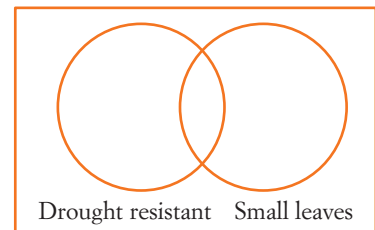
   a the coins are both five cent coins.

b the coins are both twenty cent coins.

c the coins add to thirty cents.

8 At the local nursery there are 30 species of plants. 15 of these are drought resistant, 20 have small leaves and 12 are both drought resistant and have small leaves.

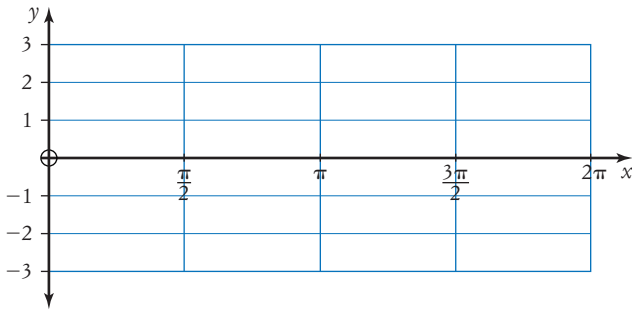   **a** Illustrate this with a Venn diagram.

Drought resistant   Small leaves

    b Find the probability a randomly selected plant:

        i is drought resistant.

        ii has small leaves given the plant selected is drought resistant.

9 Solve $\sin(x) = -\dfrac{\sqrt{3}}{2}$ for $0 \leq x \leq 2\pi$

10 Sketch $y = 2\cos(x) - 1$ over the domain $0 \le x \le 2\pi$

11 Use the exact values for $\dfrac{\pi}{4}$ and $\dfrac{\pi}{3}$ and the compound angle formula

$\sin(a + b) = \sin(a)\cos(b) + \cos(a)\sin(b)$ to find $\sin\left(\dfrac{7\pi}{12}\right)$

12 Write the first four terms of the arithmetic sequence with a fourth term of 12 and a 10th term of 60.

13 A geometric sequence has the terms 9, x, 81 …

   a Find x.

   b Find the sum of the first 4 terms.

14 How many terms are there in the series $2 + 5 + 8 + \ldots + t_n = 40$?

15 For the function $y = 4x^2 + x - 3$. Find:

  a $\dfrac{dy}{dx}$

  b the gradient of the tangent at $x = -1$.

  c the equation of the tangent at $x = -1$.

  d the acute angle the tangent at $x = -1$ makes with X axis (round to one decimal place).

16 Simplify:

  a $\dfrac{a^3 b^6 \times a^5 b^{-2}}{a^{-6} b^{-4}}$

  b $\dfrac{9^4 \times 27^{-1} \times 3^2}{81^2}$

17 The exponential function given by $f(x) = a \times b^x$ produces the table of values below. Find the values of a and b.

x	0	1	2	3
$f(x)$	20	10	5	2.5

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18 The acceleration of an object is given by $6t + 5$ cm/s^2. The particle is initially at rest at the origin. Find:

   a the velocity equation in terms of t.

   b its velocity after 4 seconds.

   c the displacement equation in terms of t.

   d the displacement after 4 seconds.