FILE COPY

HALF YEARLY EXAMINATION

YEAR 9 2007

MATHEMATICS

Time Allowed – 85 minutes plus 5 minutes reading time

INSTRUCTIONS:

- All questions may be attempted
- Start each section on a new sheet of paper
- Write your name at the top of each page
- Department of Education approved calculators are permitted
- Department of Education approved templates are permitted
- Show all necessary working
- Marks may not be awarded for untidy or carelessly arranged work
- No grid paper is to be used unless provided with the examination paper

SECTION A (15 MARKS) **Marks**

1. Factorise $4a^2 - 12a + 9$ **1**

2. Expand and simplify $(k+2)^2 - (k-2)^2$ **2**

3. Simplify $2\sqrt{8} - 3\sqrt{32}$ **2**

4. Make y the subject of $x = \dfrac{y+1}{y}$ **2**

5. How many dollars in x cents? **1**

6. Two cards are drawn at random in succession from a standard pack of playing cards, without replacement. **1**
   What is the probability of getting two black cards?

7. Simplify $(4a^2)^3 \div 8a$ **2**

8. Simplify $\dfrac{m^2 - 49}{3m - 21}$ **2**

9. Herron's Formula states that the area of the triangle with side lengths a, b, c is given by $Area = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \dfrac{a+b+c}{2}$. **2**
   Find the area of the triangle below, correct to three decimal places.

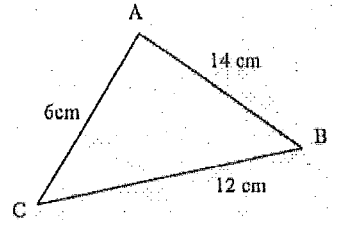


Diagram not to scale

SECTION 2 (15 MARKS) **Start a new page** **Marks**

1. Neatly draw a circle. On your circle draw a chord AB and shade the area of the major segment. **2**

2. Find the exact volume of a cube with sides of length $4\sqrt{2}$ cm. **2**

3. Solve for x: $x^2 + 32 = 12x$ **3**

4. Factorise $27 + x^3$ **1**

5. Using Pythagoras' Theorem, find the length of the side AB in Δ ABC. Leave answer in simplified form. **3**

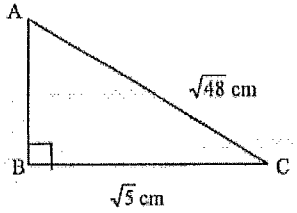


Diagram not to scale

6. (i) Prove that ΔABC and ΔADE are similar **2**

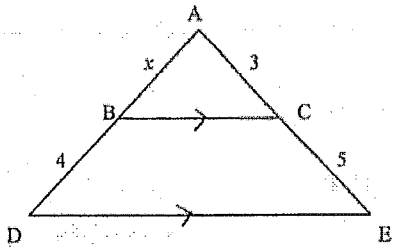


Diagram not to scale

(ii) Hence find x, giving reasons. **2**

SECTION C (15 MARKS) **Start a new page** **Marks**

1. Factorise:

(i) $6x^2 + 12x$ **1**

(ii) $y^2 - 10y + 21$ **1**

(iii) $mn - 2m - 3n + 6$ **2**

2. Solve for x: $\frac{1}{2} = \sqrt{8 - x}$ **2**

3. If $x = \sqrt{3} - 2$ and $y = \sqrt{3} + 2$, find the exact value of $x^2 y^2$ **2**

4. Solve for x: $x(x+4) = (x+2)(x-1)$ **2**

5. The probability that Isaac can solve a certain Maths problem is 0.95, and Diana's probability of solving the same problem is 0.92.

(i) Draw a Probability tree, or otherwise, to illustrate all possible outcomes. **1**

What is the probability that:

(ii) Neither of them solve the problem **2**

(iii) Only one of them solves the problem **2**

SECTION D (14 MARKS) **start a new page** **Marks**

1. Simplify $\frac{3-a}{2}-\frac{4-a}{4}$ **2**

2. Factorise: $3x^2-14x+8$ **2**

3. ABCD is a parallelogram with PB|| DQ.

   (i) Prove $\Delta APB \equiv \Delta CQD$ **4**

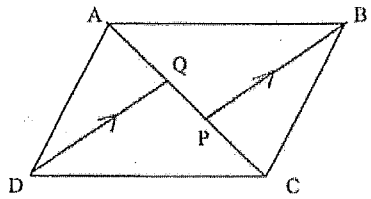
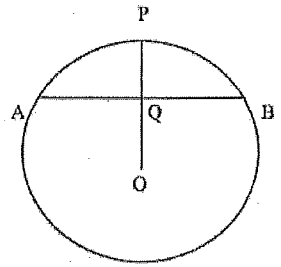


Diagram not to scale

   (ii) Hence prove that BPDQ is a parallelogram. **2**

4. O is the centre of a circle, OP is perpendicular to the chord AB, AB=14 cm and PQ= 1 cm.

   Find the exact length of the radius of the circle, giving reasons. **4**

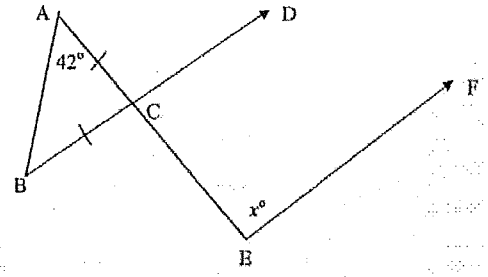


SECTION E (15 MARKS) **Marks**

1. Simplify $\frac{1}{x^2-4}-\frac{1}{x+2}$ **2**

2. If $\frac{8}{1+\sqrt{5}}=m+\sqrt{n}$, find the value of m and n. **2**

3. BD || EF. Find the value of x, giving reasons. **3**



4. A die is tossed twice.

   (i) *Complete the lattice diagram on the last page.* **1**

REMOVE THE LAST PAGE AND HAND IN WITH THE REST OF SECTION E.

What is the probability that the second number is less than :

   (ii) the first number. **1**

   (iii) the first number, if it is known that the first number is even? **2**

5. Urn A contains 3 red and 5 black marbles. Urn B contains 2 red and 8 black marbles. From urn A one marble is chosen at random and placed into urn B.

   (i) What is the probability that this marble is red? **1**

   (ii) Now from Urn B (with the extra marble included), two marbles are drawn at random in succession without replacement. Find the probability that they are both the same colour? **2**

Complete this table.

Hand it in with **your** section E **answers**.

2nd die

1st die		**1**	**2**	**3**	**4**	**5**	**6**
	1	1 **1**	1 **2**	1 **3**	1 **4**	1 **5**	1 **6**
	2	2 **1**	2 **2**	2 **3**	2 **4**	2 **5**	2 **6**
	3	3 **1**	3 **2**	3 **3**	3 **4**	3 **5**	3 **6**
	4	4 **1**	4 **2**	4 **3**			
	5	5 **1**	5 **2**	5 **3**			
	6	6 **1**	6 **2**	6 **3**			

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SECTION A

1. $(2a-3)^2$ (1)

2. $(k+2+k-2)(k+2-k+2)$
$= (2k)(4)$
$= 8k$ (2)

3. $2(2\sqrt{2}) - 3(4\sqrt{2})$
$= 4\sqrt{2} - 12\sqrt{2}$
$= -8\sqrt{2}$ (2)

4. $xy = y+1$
$xy - y = 1$ (2)
$y(x-1) = 1$
$y = \frac{1}{x-1}$

5. $\frac{x}{100}$ or // $D = \frac{x}{100}$ (1)

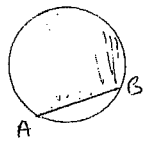
6. $P(B,B)$
$= \frac{26}{52} \times \frac{25}{51}$
$= \frac{25}{102}$ (1)

7. $= 64a^b \div 8a$
$= 8a^5$ (2)

8. $= \frac{(m-7)(m+7)}{3(m-7)}$
$= \frac{m+7}{3}$ (2)

9. $S = \frac{6+14+12}{2} = 16$
$A = \sqrt{16(16-6)(16-12)(16-14)}$
$= \sqrt{16 \times 10 \times 4 \times 2}$
$= \sqrt{1280}$
$= 35.777_{cm^2}$ (2)

Section B

1. 

(2)

2. $V = (4\sqrt{2})^3$
$= 64 \times 2\sqrt{2}$
$= 128\sqrt{2}\ cm^3$ (2)

3. $x^2 - 12x + 32 = 0$
$(x-8)(x-4) = 0$
$\therefore x = 8$ or $x = 4$ (3)

4. $(3+x)(9-3x+x^2)$ (1)

5. $\sqrt{48}^2 = \sqrt{5}^2 + AB^2$ (Pythagoras)
$48 = 5 + AB^2$
$43 = AB^2$
$AB = \sqrt{43}$ cm (3)

6. i) In $\triangle$'s ABC, ADE
$\hat{A}$ is common (2)
$\angle ABC = \angle ADE$ (corresponding ~~alternate angles~~ are equal, BC // DE)
$\therefore \triangle ABC \,|||\, \triangle ADE$ (equiangular)

ii) $\frac{x}{4} = \frac{3}{5}$ (a line parallel to one side of a triangle divides other 2 sides in same ratio)
$\therefore x = 2\frac{2}{5}$
(2)

SECTION C

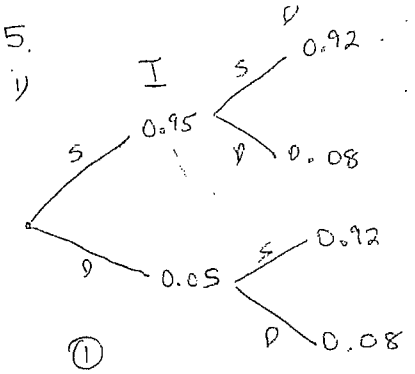
1. i) $6x(x+2)$ (1)

ii) $(y-7)(y-3)$ (1)

iii) $m(n-2) - 3(n-2)$
$= (n-2)(m-3)$ (2)

2. $\frac{1}{4} = 8 - x$
$x = 8 - \frac{1}{4}$
$x = 7\frac{3}{4}$ (2)

3. $= (\sqrt{3}-2)^2(\sqrt{3}+2)^2$
$= [(\sqrt{3}-2)(\sqrt{3}+2)]^2$
$= (3-4)^2$
$= 1$ (2)
or // $= (3+4-4\sqrt{3})(3+4+4\sqrt{3})$
$= (7-4\sqrt{3})(7+4\sqrt{3})$
$= 49 - 48$
$= 1$

5. 

i) (1)

ii) $0.05 \times 0.08 = 0.004$ (2)

iii) $(0.95 \times 0.08) + (0.05 \times 0.92$
$=$
$=$ (2)

4. $x^2 + 4x = x^2 + x - 2$
$3x = -2$
$x = -\frac{2}{3}$ (2)

SECTION D

1. $= \frac{6-2a}{4} - \frac{(4-a)}{4}$
$= \frac{2-a}{4}$ (2)

2. $= 3x^2 - 12x - 2x + 8$
$= 3x(x-4) - 2(x-4)$
$= (3x-2)(x-4)$ (2)

3.

i) In Δ's ABP, CQD

$B\hat{A}P = Q\hat{C}D$ (alternate angles are equal, AB || DC)

Similarly $A\hat{P}B = D\hat{Q}C$

AB = CD (opposite sides of parm ABCD are equal).

(4)

$\therefore \Delta ABP \equiv \Delta CQD$ (AAS)

ii) BP = DQ (corresponding sides in congruent triangles are equal).

BP || DQ data

(2)

$\therefore$ BPDQ is a parm.

(one pair of opposite sides both equal and parallel.)

4. $AQ = \frac{14}{2}$ (perpendicular line from centre bisects the chord).

$\therefore AQ = 7$

In ΔAQO

(4)

$7^2 + (r-1)^2 = r^2$ (Pythagoras)

$49 + r^2 - \cdot r + 1 = r^2$

$50 = 2r$

$\therefore r = 25$

$\therefore$ radius is 25 cm

SECTION E

1. $\frac{1}{(x-2)(x+2)} - \frac{(x-2)}{(x-2)(x+2)}$

$= \frac{1 - x + 2}{(x-2)(x+2)}$

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

2. $\frac{8}{1+\sqrt{5}} \times \frac{1-\sqrt{5}}{1-\sqrt{5}} = \frac{8(1-\sqrt{5})}{-4}$

$= -2(1-\sqrt{5})$

$= -2 + 2\sqrt{5}$

(2)

$\therefore m = -2$ $\quad \sqrt{n} = 2\sqrt{5}$

$n = 20$

3. $A\hat{B}C = 42^\circ$ (equal angles are opposite equal sides in ΔABC).

$\therefore A\hat{C}D = 84^\circ$ (exterior angle of ΔABC equals sum of 2 interior opposite angles).

(3)

$\therefore x = 84^\circ$ (corresponding angles are equal, CD || EF).

4. i) (1) for completing table.

ii) $\frac{15}{36} = \frac{5}{12}$ (1)

iii) $\frac{9}{18} = \frac{1}{2}$ (2)

5. A: 3R, 8G $\quad$ B: 2R, 8B

ii) Prob $\left(\frac{3}{8}\right)$ of Red $\therefore$ 3R, 8B

2R, 9B

$= \left(\frac{3}{8} \times \frac{3}{11} \times \frac{2}{10}\right) + \left(\frac{3}{8} \times \frac{8}{11} \times \frac{7}{10}\right) +$

(2)

$\left(\frac{5}{8} \times \frac{2}{11} \times \frac{1}{10}\right) + \left(\frac{5}{8} \times \frac{9}{11} \times \frac{5}{10}\right)$

$= \frac{9}{440} + \frac{21}{110} + \frac{1}{88} + \frac{9}{22}$

$= \frac{139}{220}$

5. i) P(red) = $\frac{3}{8}$ (1)