DULWICH COLLEGE | SINGAPORE |

Year Examination
Mathematics (Accelerated)

Paper 4

May 2017

Name:…………………………………………….................

Time allowed: 1 hour 30 minutes

Total Marks	/83	Teacher comment:
	%	
Level/Grade		

Student reflection

1 **(a)** Last year a golf club charged $1650 for a family membership.
This year the cost increased by 12%.

Calculate the cost of a family membership this year.

Answer(a) $ .... [2

(b) The golf club runs a competition.
The total prize money is shared in the ratio   1st prize : 2nd prize = 9 : 5.
The 1st prize is $500 more than the 2nd prize.

(i) Calculate the total prize money for the competition.

Answer(b)(i) $ .... [2]

(ii) What percentage of the total prize money is given as the 1st prize?

Answer(b)(ii) .... % [1]

(c) For the members of the golf club the ratio   men : children = 11 : 2.
The ratio   women : children = 10 : 3.

(i) Find the ratio   men : women.

Answer(c)(i) .... : .... [2

(ii) The golf club has 24 members who are children.

Find the total number of members.

Answer(c)(ii) .... [3]

(d) The club shop sold a box of golf balls for $20.40 .
The shop made a profit of 20% on the cost price.

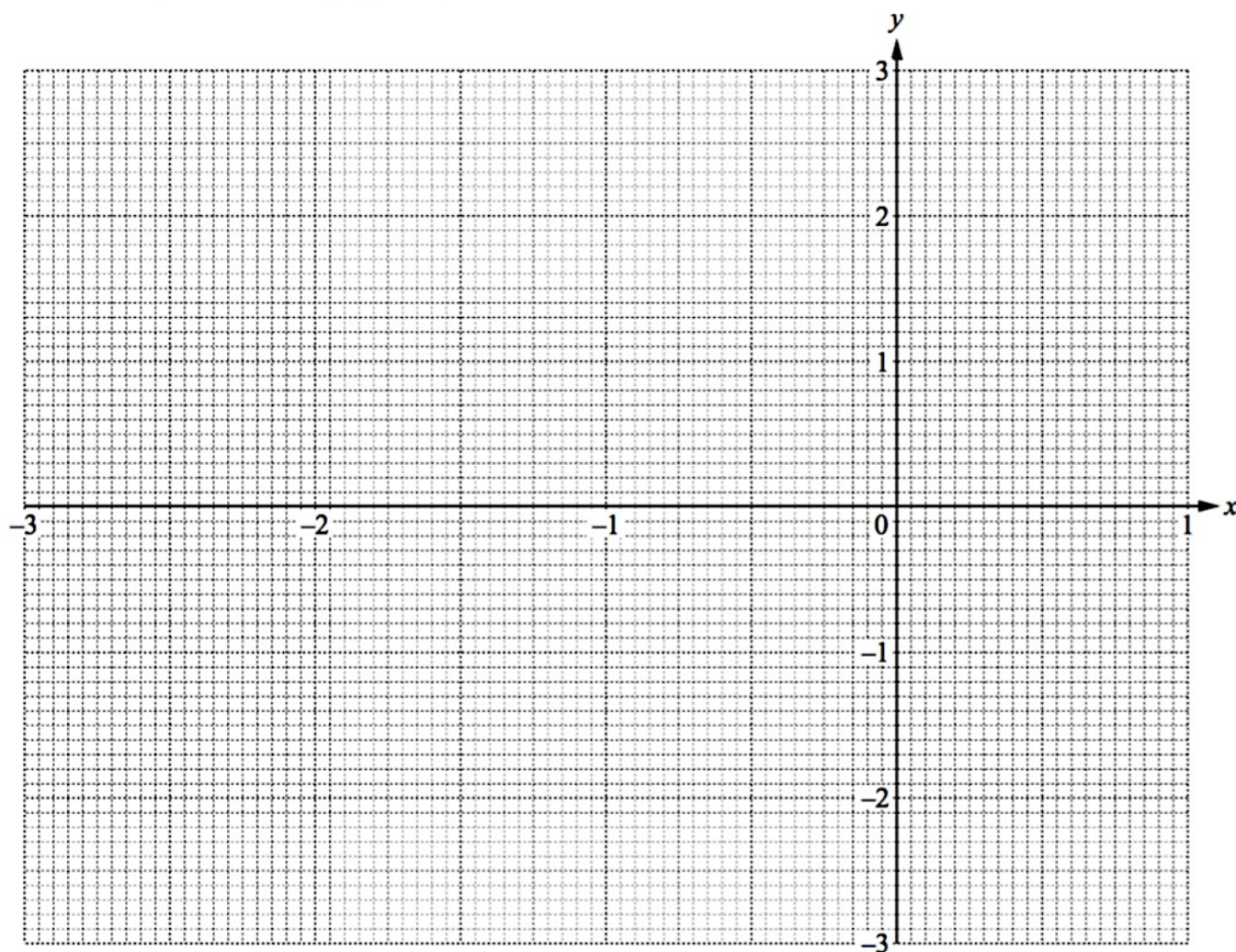Calculate the cost price of the golf balls.

Answer(d) $ .... [3]

2. The table shows some values of $y = x^3 + 3x^2 - 2$.

x	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1
y	-2	1.13		1.38		-1.38		-1.13	

(a) Complete the table of values. [3

(b) On the grid, draw the graph of $y = x^3 + 3x^2 - 2$ for $-3 \leqslant x \leqslant 1$.

[4]

By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = -1.75$
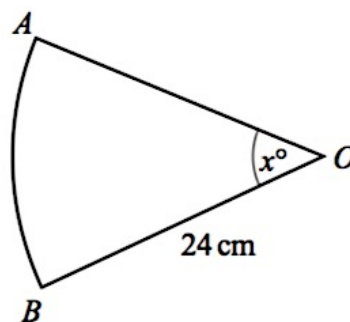
Answer(d) .... [3

3. Simplify.

$$\frac{4 + 10w}{8 - 50w^2}$$

Answer .... [4]

4. **(a)** The diagram shows a sector of a circle with centre O and radius 24 cm.

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(i) The total perimeter of the sector is 68 cm.

Calculate the value of x.

Answer(a)(i) $x = $ .... [3]

(ii) The points A and B of the sector are joined together to
make a hollow cone.
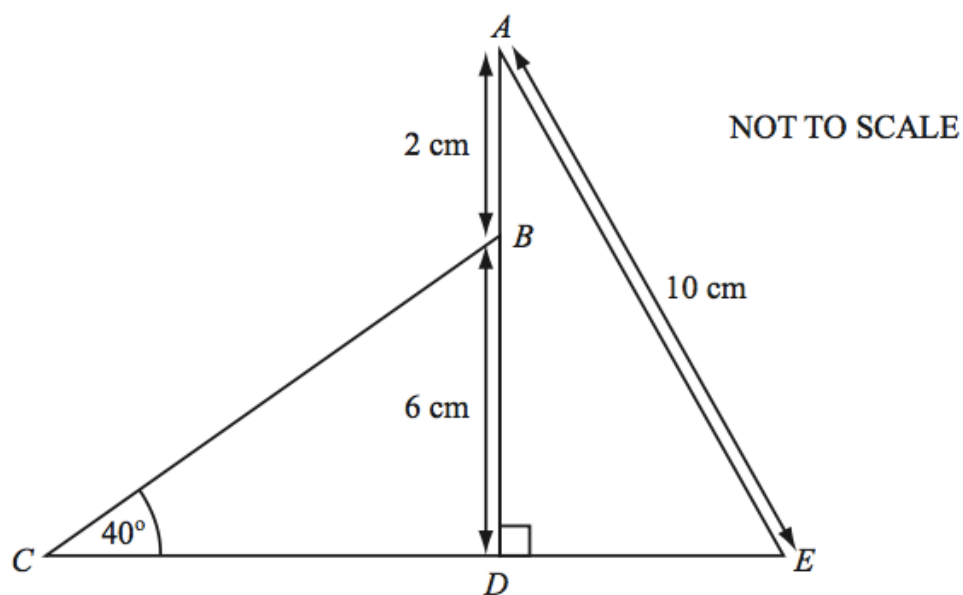The arc AB becomes the circumference of the base of the cone.

O

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AB
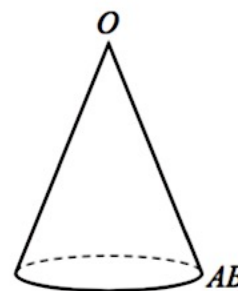
Calculate the volume of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(a)(ii) .... cm^3 [6]

5.

On the above diagram, $AB = 2$ cm, $BD = 6$ cm, $AE = 10$ cm, angle $BCD = 40°$ and angle $BDE = 90°$.

(a) Write down the length of AD.

Answer(a) AD =   cm [1]

(b) **Calculate** the length of DE.

Answer(b) DE =   cm [2]

(c) **Calculate** the size of angle AED.

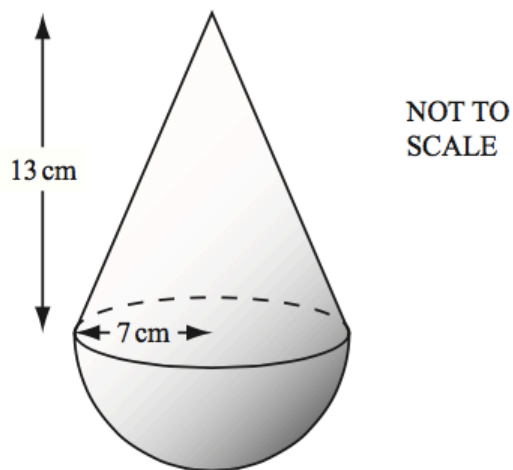*Answer(c)* angle $AED =$ [2]

(d) **Calculate** the length of CD.

Answer(d) CD =   cm [3]

(e) Find the length of CE.

Answer(e) CE =   cm [1]

6.

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13 cm

7 cm

The diagram shows a solid made up of a hemisphere and a cone.
The base radius of the cone and the radius of the hemisphere are each 7 cm.
The height of the cone is 13 cm.

(a) (i) Calculate the total volume of the solid.

[The volume of a hemisphere of radius r is given by $V = \frac{2}{3}\pi r^3$.]

[The volume of a cone of radius r and height h is given by $V = \frac{1}{3}\pi r^2 h$.] [2]

(ii) The solid is made of wood and 1 cm³ of this wood has a mass of 0.94 g.
Calculate the mass of the solid, in kilograms, correct to 1 decimal place. [3]

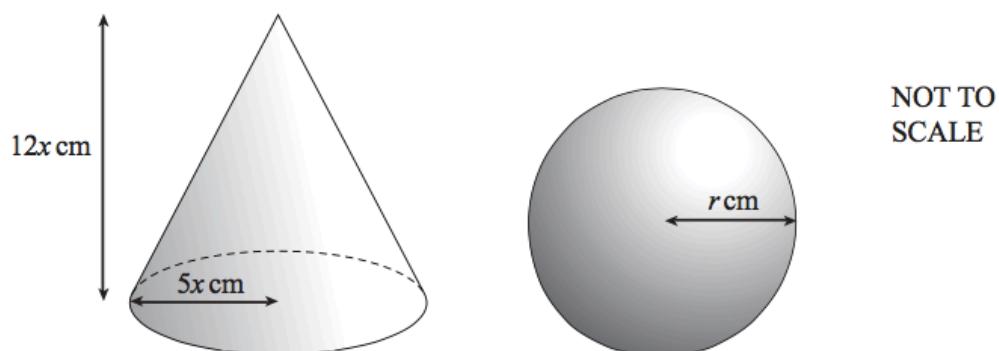**(b)** Calculate the curved surface area of the cone.
[The curved surface area of a cone of radius r and sloping edge l is given by $A = \pi r l$.] [3]

(c) The cost of covering all the solid with gold plate is $411.58.
Calculate the cost of this gold plate per square centimetre.

[The curved surface area of a **hemisphere** is given by $A = 2\pi r^2$.] [5]

(d)

The diagram below shows a solid circular cone and a solid sphere.

12*x* cm

5*x* cm

r cm

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The cone has the same **total** surface area as the sphere.
The cone has radius 5*x* cm and height 12*x* cm.
The sphere has radius *r* cm.

Show that $r^2 = \frac{45}{2}x^2$.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]
[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

(4)

7. Find the *n*th term of each of the following sequences.

(a)   21,   17,   13,   9,   5, ...

Answer(a)   ....   [2]

(b)   3,   6,   12,   24,   48, ...

Answer(b)   ....   [2]

(c) $\dfrac{1}{4}$, $\dfrac{4}{5}$, $\dfrac{9}{6}$, $\dfrac{16}{7}$, $\dfrac{25}{8}$, ...

Answer (c)   ....   (2)

(b) A sequence of diagrams is formed by drawing equilateral triangles with sides that measure one centimetre.
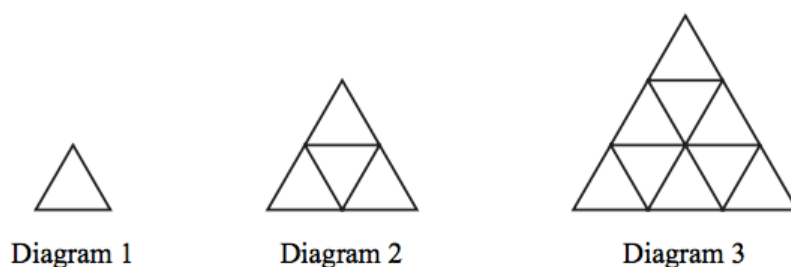

Diagram 1   Diagram 2   Diagram 3

Diagram 1 has 3 one-centimetre lines.
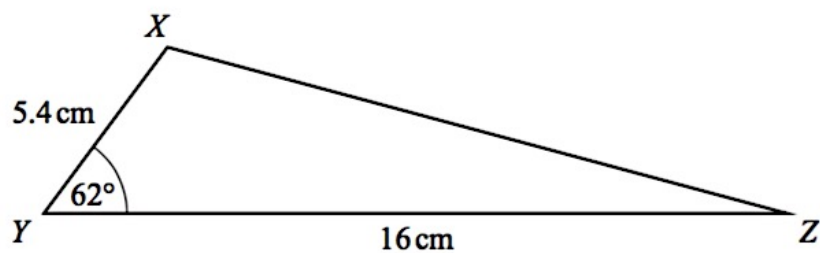Diagram 2 has 9 one-centimetre lines.

The expression for the **total** number of one-centimetre lines needed to draw **all of the first *n* diagrams** is

$$an^3 + bn^2 + n.$$

Find the value of *a* and the value of *b*.

a = ...   b = ...   (4)

8. **(a)**

Show that the area of triangle XYZ is 38.1 cm^2, correct to 1 decimal place.

Answer(a)

[2

(b)
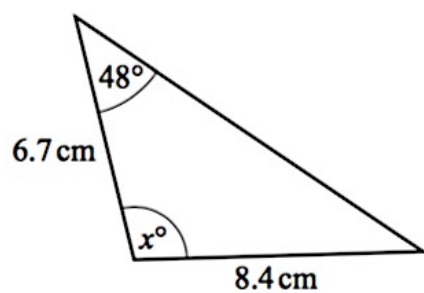
Calculate the value of x.

Answer(b) x = ... [4

(c)

North

A

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P

B
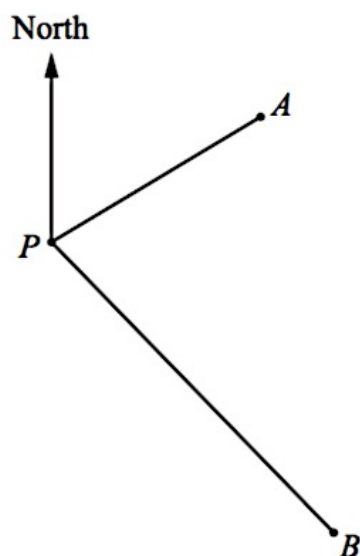
Ship *A* is 180 kilometres from port *P* on a bearing of 063°.
Ship *B* is 245 kilometres from *P* on a bearing of 146°.

Calculate *AB*, the distance between the two ships.

Answer(c) .... km [5]