Carlingford High School

Mathematics
Year 10 Term 3 Examination
5.2 Course
2014

Name: _____   Class: 10M1
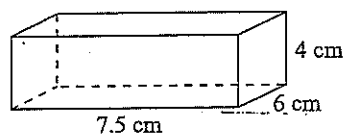
Teacher:_____

Time allowed: 55 minutes

- Board approved calculators may be used.
- Show all necessary working.
- Marks may be deducted for careless or untidy work.
- Complete the examination in blue or black pen.
- All diagrams are **NOT** drawn to scale

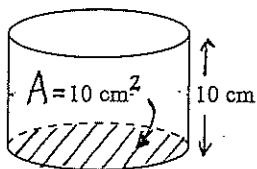| Topic	Volume	Probability	Statistics	Trigonometry	Congruent & Similar triangles	Total
Mark	/15	/9	/13	/18	/10	/60

VOLUME (15 marks)

1. Find the volume of the following prisms:
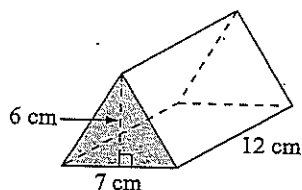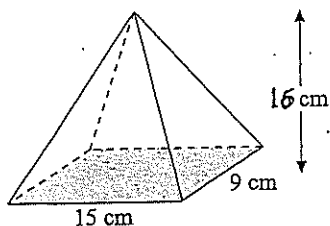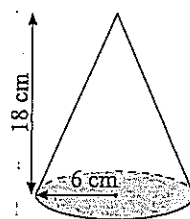
    (a)

    4 cm
    6 cm
    7.5 cm

    (b)

    $A = 10$ cm^2 10 cm

    (c)

    6 cm
    12 cm
    7 cm

2. Calculate the volume of the pyramid

    16 cm
    9 cm
    15 cm

3. (a) Find the area of the base of the cone (1dp)

    18 cm
    6 cm

    (b) Hence, find the volume of the cone (1dp)

4. Given the formula for the volume of a sphere
    is $V = \frac{4}{3}\pi r^3$ calculate the volume of a
    hemisphere with diameter 4 *metres*
    (give your answer correct to 4 significant
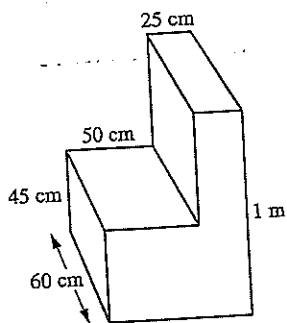   figures)

5. Consider a solid that is made up of a square
    pyramid one metre in height sitting on top of
    a cube with side length 1 metre.
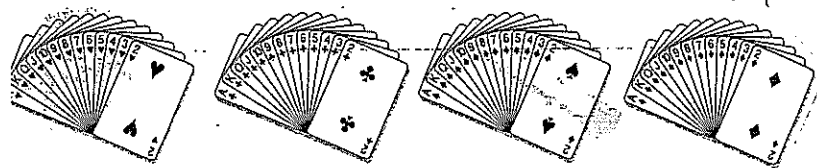
    (a) Draw a sketch

(b) Find the volume (1dp)

(c) A King .

(c) Given that $1\ m^3$ holds 1000 *litres* what is the capacity of the solid, to the nearest whole number.

2. A batch of light globes was tested to determine how many hours they burned. The results of the test are in the table below.

6. Calculate the volume to the nearest cm^3

25 cm

50 cm

45 cm

1 m

60 cm

No. of hours	No. of globes
less than 500	4
500–750	12
750–1000	15
1000–1250	102
1250–1500	32
more than 1500	35

(a) How many globes were tested?

(b) How many globes burned for between 750 and 1000 hours?

(c) How many globes burned for 1000 hours or less?

PROBABILITY (9 marks)

1. A card is chosen from a standard deck of 52 cards. Find the probability that the card chosen is :

(a) Red

(d) What is the relative frequency of those that burned for 1000 hours or less (leave answer as a fraction)

(e) Add a relative frequency column to the table (answer to 3 decimal places)

(f) What does the relative frequency column add up to?

(b) The Ace of diamonds

STATISTICS (13 marks)

1. Given the scores below:

   8, 5, 0, 5, 7, 5, 4, 2, 9.

(a) Complete the five point summary:

   Lowest score =
   1st quartile=
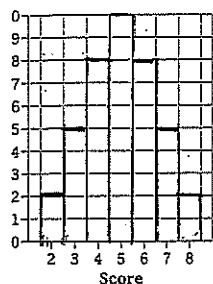   Median=
   3rd quartile=
   Highest score=

(b) Construct a box and whisker plot
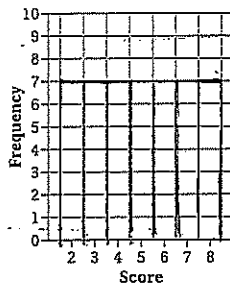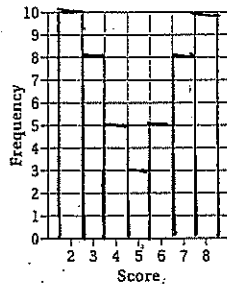

2. Consider the distributions below:

A   B   C

(a) Which distribution(s) is normal?

(b) Which distribution(s) is uni-modal?

(c) Which are symmetrical?

(d) Are any of the distributions skewed? YES/NO

(e) Which has the smallest standard deviation?

(f) The mean of the three distributions is the same. What is it?

TRIGONOMETRY (18 marks)

1. Calculate the following correct to 3 decimal places:

   (a) $\sin 46° =$
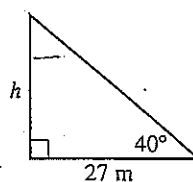
   (b) $\tan 73°48 =$

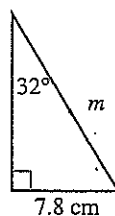2. Calculate θ correct to the nearest degree
   $$\cos\theta = 0.5309$$

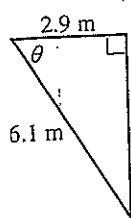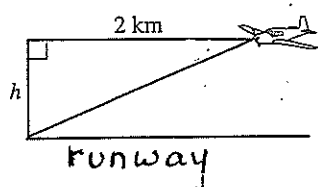3. Find the length of the side marked with a pronumeral, correct to 1 decimal place.

   (a)

   (b)

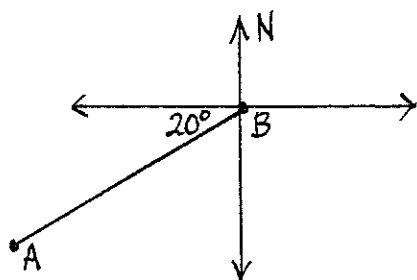4. Find the size of angle θ, giving your answer in degrees and minutes.

5. When a plane is $2km$ from a runway, the angle of depression to the runway is $10°$.

runway

   (a) Mark on the angle of depression.

   (b) Find the altitude (h) of the plane correct to the nearest metre.

6. Write the bearing of town A from town B in:

   (a) Compass bearings

   (b) Three figure bearings

7. A ship sails $45km$ south and then $72km$ east.

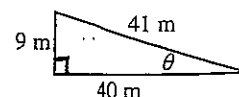   (a) Draw a diagram, making a right angled triangle.

   (b) Find the angle at the starting point, correct to the nearest degree.

   (c) What is the bearing of the ship from its starting point.

8. By considering the triangle and the two statements, which of the statements is true?

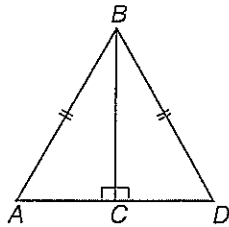Statement 1. $\cos \theta = \frac{9}{41}$

Statement 2. $\tan \theta = \frac{9}{40}$

   A. 1 only
   B. 2 only
   C. Both 1 and 2
   D. Neither statement

SIMILAR AND CONGRUENT TRIANGLES
(10 marks)

1. Show that $\triangle ABC$ and $\triangle DBC$ are congruent, by filling in the missing spaces.
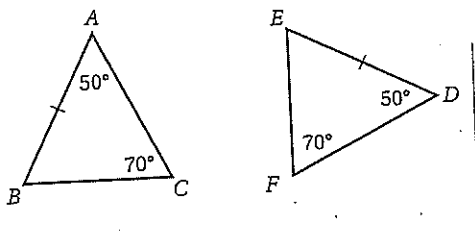

$$AB = \underline{\qquad} \quad (given)$$
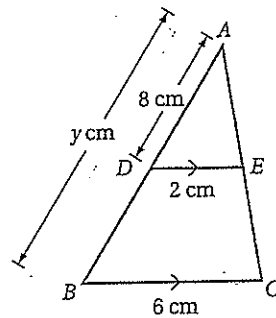
$$\angle BCA = \angle BCD \quad (\underline{\qquad\qquad})$$

$$BC \; is \; \underline{\qquad\qquad\qquad}$$

$$\therefore \triangle ABC \equiv \triangle DBC \; (\underline{\qquad} \; test)$$

2. What congruency test proves that the two triangles are congruent?

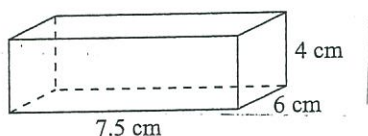3. Considering the two similar triangles $\triangle ADE$ and $\triangle ABC$,

(a) Which angle matches with $\angle ADE$?

(b) Which angle is common?

(c) What is the reason the two triangles are similar?

(d) Find the value of y

VOLUME (15 marks)
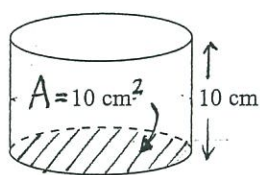
1. Find the volume of the following prisms:

   (a)

   4 cm
   6 cm
   7.5 cm

   $V = 7.5 \times 6 \times 4$
   $= 180 \text{ CM}^3 \checkmark$ ①

   (b)

   $A = 10 \text{ cm}^2$ 10 cm

   $V = 10 \times 10$
   $= 100 \text{ CM}^3 \checkmark$ ①

   (c)

   6 cm
   12 cm
   7 cm
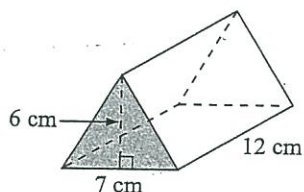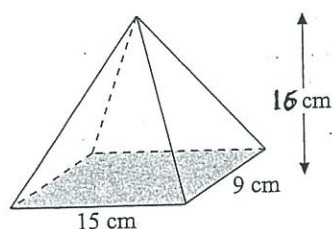
   $V = \left(\dfrac{6 \times 7}{2}\right) \times 12 \checkmark$
   $= 252 \text{ cm}^3 \checkmark$ ②
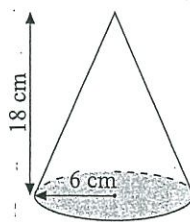
2. Calculate the volume of the pyramid

   16 cm
   9 cm
   15 cm   ②

   $V = \dfrac{1}{3} \times (15 \times 9) \times 16 \checkmark$
   $= 720 \text{ cm}^3 \checkmark$

3. (a) Find the area of the base of the cone (1dp)

   18 cm
   6 cm

   $A = \pi r^2$
   $= \pi \times 6^2$
   $= 113.097...$ ①
   $= 113.1 \text{ cm}^2 \checkmark$

   (b) Hence, find the volume of the cone (1dp)
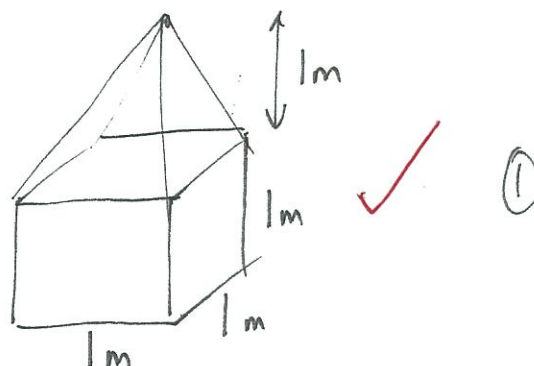
   $V = \dfrac{1}{3} \times A \times h$
   $= \dfrac{1}{3} \times 113.1 \times 18 \checkmark$ ①
   $\doteqdot 678.6 \text{ cm}^3 \checkmark$

4. Given the formula for the volume of a sphere is $V = \dfrac{4}{3}\pi r^3$ calculate the volume of a **hemisphere** with diameter 4 *metres* (give your answer correct to 4 significant figures)

   $V = \dfrac{1}{2} \times \dfrac{4}{3}\pi r^3$
   $= \dfrac{1}{2} \times \dfrac{4}{3} \times \pi \times 2^3 \checkmark$ ②
   $= 16.7551...$
   $= 16.76 \text{ m}^3 \checkmark$

5. Consider a solid that is made up of a square pyramid one metre in height sitting on top of a cube with side length 1 metre.

   (a) Draw a sketch

   1m
   1m
   1m
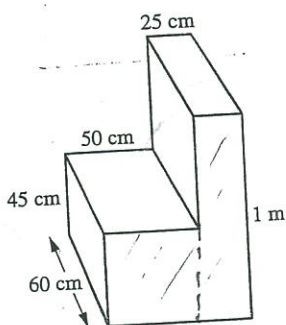   1m   ✓ ①

(b) Find the volume (1dp)

$$V = 1^3 + \frac{1}{3} \times 1^3$$
$$= 1 + \frac{1}{3}$$
$$= 1\frac{1}{3} \text{ OR } \frac{4}{3} m^3 \checkmark ①$$

(c) Given that $1\,m^3$ holds 1000 *litres* what is the capacity of the solid, to the nearest whole number.

$$\frac{4}{3} \times 1000\ell \doteqdot 1333\ell \; ①$$

6. Calculate the volume to the nearest cm^3

25 cm
50 cm
45 cm
60 cm
1 m

$$A = (25 \times 100) + (50 \times 45)$$
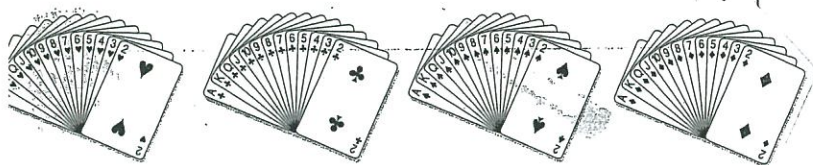$$= 4750 \; cm^2 \checkmark$$

$$V = A \times h$$
$$= 4750 \times 60$$
$$= 285\,000 \; cm^3 \checkmark$$

②

④

PROBABILITY (9 marks)

1. A card is chosen from a standard deck of 52 cards. Find the probability that the card chosen is :

(a) Red $\quad \dfrac{26}{52} = \dfrac{1}{2} \checkmark ①$

(b) The Ace of diamonds $\dfrac{1}{52} \checkmark ①$

(c) A King $\quad \dfrac{4}{52} = \dfrac{1}{13} \checkmark ①$

2. A batch of light globes was tested to determine how many hours they burned. The results of the test are in the table below.

No. of hours	No. of globes	Relative fr
less than 500	4	0·020
500–750	12	0·060
750–1000	15	0·075
1000–1250	102	0·510
1250–1500	32	0·160
more than 1500	35	0·175

$\Sigma = 1$

(a) How many globes were tested?

$200 \checkmark ①$

(b) How many globes burned for between 750 and 1000 hours?

$15 \checkmark ①$

(c) How many globes burned for 1000 hours or less?

$4 + 12 + 15 = 31 \checkmark ①$

(d) What is the relative frequency of those that burned for 1000 hours or less (leave answer as a fraction)

$\dfrac{31}{200} \checkmark ①$

(e) Add a relative frequency column to the table (answer to 3 decimal places)

①

(f) What does the relative frequency column add up to? $1 \checkmark ①$

⑨

STATISTICS (13 marks)

1. Given the scores below:
   8, 5, 0, 5, 7, 5, 4, 2, 9.

   $0, 2, 4, 5, (5), 5, 7, 8, 9$

(a) Complete the five point summary:
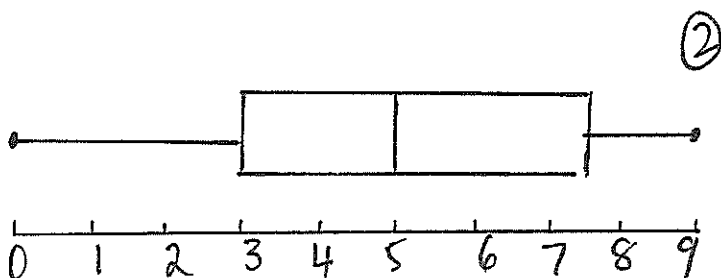
   Lowest score = 0
   1st quartile= 3
   Median= 5
   3rd quartile= 7.5 ⑤
   Highest score= 9
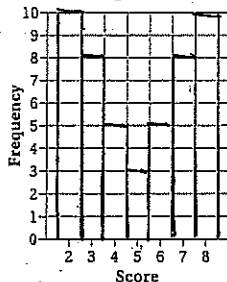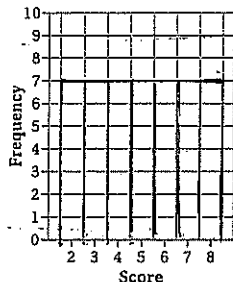
(b) Construct a box and whisker plot
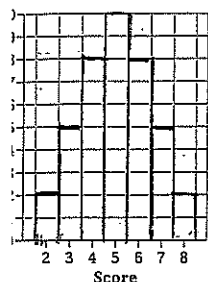
       ②

2. Consider the distributions below:

(a) Which distribution(s) is normal?

   ① A

(b) Which distribution(s) is uni-modal?

   ① A

(c) Which are symmetrical?

   ① A, B, C

(d) Are any of the distributions skewed? YES/NO ①

(e) Which has the smallest standard deviation? ①

   A

(f) The mean of the three distributions is the same. What is it? ① 5

TRIGONOMETRY (18 marks)

1. Calculate the following correct to 3 decimal places:
   (a) $\sin 46° = 0.719$
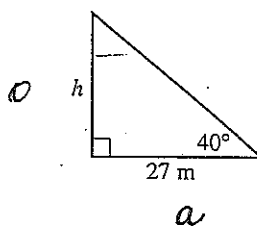
   (b) $\tan 73°48 = 3.442$ ②

2. Calculate θ correct to the nearest degree
   $\cos\theta = 0.5309$ ①

   $58°$

3. Find the length of the side marked with a pronumeral, correct to 1 decimal place.
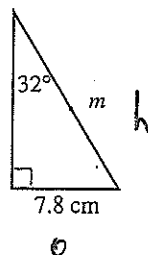
   (a)

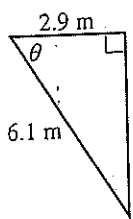 $\tan 40° = \dfrac{h}{27}$

   $h = 27 \times \tan 40°$

   $= 22.7 m$ ②

   (b)

   $\sin 32° = \dfrac{7.8}{m}$

   $m = \dfrac{7.8}{\sin 32°}$

   $= 14.7 \, cm$ ②

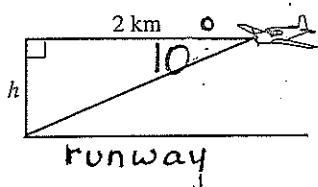4. Find the size of angle θ, giving your answer in degrees and minutes.

2.9 m
θ
6.1 m

$\cos \theta = \dfrac{2\cdot9}{6\cdot1}$

$\theta = \cos^{-1}(0\cdot4754)$

$= 61°37'$

②

5. When a plane is $2km$ from a runway, the angle of depression to the runway is $10°$.

2 km
10
h
runway

(a) Mark on the angle of depression. ①

(b) Find the altitude (h) of the plane correct to the nearest metre.
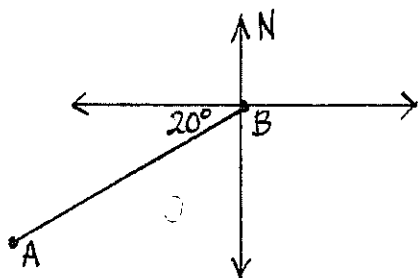
$\tan 10° = \dfrac{h}{2}$

$h = 2 \times \tan 10°$

$= 0\cdot3526\ldots km$

$\doteqdot 353\,m$

②

6. Write the bearing of town A from town B in:
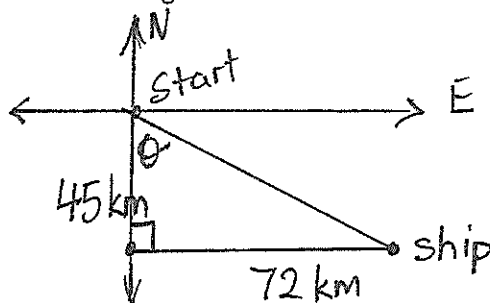

N
20° B
A

(a) Compass bearings $S\,70°W$

(b) Three figure bearings $250°$

②

7. A ship sails $45km$ south and then $72km$ east.

(a) Draw a diagram, making a right angled triangle.

N
Start
E
θ
45 km
72 km
ship

①

(b) Find the angle at the starting point, correct to the nearest degree.

$\tan\theta = \dfrac{72}{45}$

$\theta = 58°$
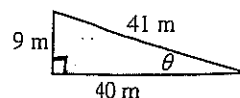
①

(c) What is the bearing of the ship from its starting point.

$180° - 58° = 122°T$

①

8. By considering the triangle and the two statements, which of the statements is true?

Statement 1. $\cos\theta = \dfrac{9}{41}$

Statement 2. $\tan\theta = \dfrac{9}{40}$

41 m
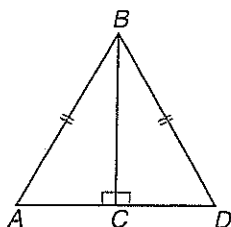9 m
θ
40 m

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither statement

①

SIMILAR AND CONGRUENT TRIANGLES
(10 marks)

1. Show that $\triangle ABC$ and $\triangle DBC$ are congruent, by filling in the missing spaces.

$AB = \underline{DB}$ (given)
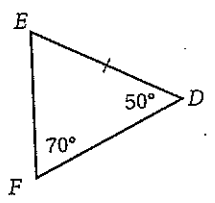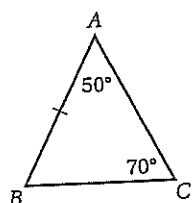
$\angle BCA = \angle BCD$ ($\underline{given}$)

BC is $\underline{common\ (shared)}$

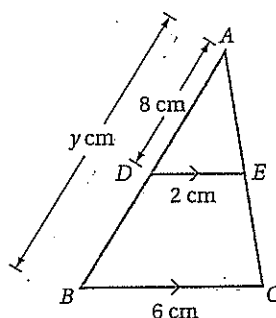$\therefore \triangle ABC \equiv \triangle DBC$ ($\underline{RHS}$ test)

④

2. What congruency test proves that the two triangles are congruent?

AAS ①

3. Considering the two similar triangles $\triangle ADE$ and $\triangle ABC$,

(a) Which angle matches with $\angle ADE$?

$\angle ABC$ OR $\angle DBC$ ①

(b) Which angle is common?

$\angle A$ ①

(c) What is the reason the two triangles are similar?

All matching angles are equal (equiangular) ①

(d) Find the value of y

$$\frac{y}{8} = \frac{6}{2}$$

$$y = \frac{6}{2} \times 8$$

$$= 24 \text{ cm}$$

②